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The effects of disgust eliciting persuasive messages on physical activity.

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The effects of disgust eliciting persuasive messages on physical activity.

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Dissertation

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas at Austin

May 2007

Dedication

To my mother, Ruth Woolf.

Acknowledgements

I would like to acknowledge and thank the following individuals for their contributions. Dr. Chris Green, thank you for your guidance, supervision, mentorship, and patience. Throughout this process you have constantly challenged me and made me a better scholar. Dr. Rachel Smith, thank you for your insights, advice, and motivational talks. Dr. Laurence Chalip, thank you for nurturing my intellectual curiosity and helping me develop my critical thinking. Dr. John Bartholomew, thank you for challenging me and providing a counterbalance to my work. Dr. Patricia Stout, thank you for helping to create limits and boundaries to my work.

In addition to my committee I also need to thank several people for their advice or help with my dissertation. I would like to thank Phil Stanforth and the staff at the Fitness Institute of Texas for their assistance and care of the participants in this study. Dr. David Arnold provided me with equipment and materials used in this study and I thank him for his willingness to always say "yes" to my requests. Dr. Michael Mahometa and Dr. Shanna Smith helped me with the statistical analysis. Dr. Jon Haidt and Dr. Paul Rozin provided me with advice and suggestions and enabled me to have a deeper appreciation for the complexity of disgust. Dr. Annie Lang also advised me and helped me better understand the physiological effects of emotions.

The effects of disgust eliciting persuasive messages on physical activity.

Publication No._____

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The University of Texas at Austin, 2007

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The increasing prevalence of obese and overweight people is associated with a concomitant decrease in health. Physical activity is associated with improvements in health, including weight loss. Social marketing campaigns are a common tool to influence health behavior. These campaigns rely on messages that persuade people to adopt the message's recommendations. Social marketing campaigns are often designed to discourage unhealthy behaviors. Many of these campaigns use emotional appeals. Little research has examined the efficacy of emotional appeals to promote physical activity. This study examines the ability of fear and disgust to increase physical activity. Fear is the most commonly used (and studied) emotion. However, fear has often been confounded by disgust. Disgust is a different emotion than fear, and a strong motivator of behavior. Further, disgust can attract and repel attention and influence social norms.

This study examined the effects of emotion—inducing messages on physical activity, cognitive processing, and social diffusion. Specifically, disgust, fear, and their interaction were investigated. A series of 4 pre—tests were conducted to test the images, text, and measures used in the main study. Two disgust—evoking images and 2 parallel

messages (1 fear—evoking, 1 not fear—evoking) were selected for inclusion in the study brochures.

Participants in the main study were university employees (n=156). Participants read either a fearful or non—fearful message promoting physical activity. The messages contained one of two disgusting images, or a neutral image. Self—report physical activity was collected prior to, shortly after, and 16 days after reading the brochure. Measures of information seeking, social diffusion, and fitness test enrollment were collected. Cognitive processing was assessed via attention, memory, and processing style.

Results indicated that highly disgusting images increase reported vigorous physical activity and information seeking. Disgust had no effect on cognitive processing, but fear negatively affected memory. There were no interactions of disgust and fear, indicating that these emotions are distinct and persuade differently. The major implication of this study is that disgust evoking messages can increase physical activity. Further, fear interferes with message encoding, thus should not be used in health appeals. Implications for practice and for future research are discussed.

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Chapter One: Introduction

In the United States, approximately 64% of all adults are overweight (CDC, 2004). Recent estimates indicate that 30% of U.S. adults are classified as obese (Flegal, Carroll, Ogden, & Johnson, 2002; CDC, 2005a) and this is defined as having a body mass index greater than 30 kg/m^2. Over the last two decades the number of overweight and obese people has continually increased (Flegal, Carroll, Kuczmarski, & Johnson, 1998). This is of concern because obesity is a direct cause of type II diabetes, hypertension, coronary heart disease, and other health related problems (Colditz, 1999). As the number of obese and overweight people and the associated health problems rises, so do the health care costs of the medical community and the tax payer. Several researchers have estimated that the excess costs attributed to overweight and obese individuals equates to 4—9% of total health care costs (Finkelstein, Fiebelkorn, & Wang, 2003; Quesenberry, Caan, & Jacobson, 1998; Thompson & Wolf, 2001; Wolf & Colditz, 1998). These costs have also been associated with greater use of health care resources (Quesenberry et al., 1998) and health care expenditures (Wee et al., 2005). In 1998, for example, medical expenses attributed to the treatment of overweight and obese people reached approximately $70 billion in the U.S. (Colditz, 1999). Moreover, Wee et al. (2005) reported that the annual health care expenditures in 2002 dollars were $2,970 for normal weight, $3,038 for overweight, and $4,333 for obese individuals. In addition, higher body mass index is associated with higher health care expenditure.

Contributing to the prevalence of overweight and obese individuals is the lack of participation in physical activity. The Behavioral Risk Factor Surveillance System (CDC, 2005b) reported that in 2002 approximately 24.4% of the U.S. adult population did not engage in any leisure—time physical activity. Physical inactivity is related to an

increased risk of developing cardiovascular disease which is the leading cause of death in the U.S. (Berlin & Colditz, 1990). Furthermore, it is estimated that lack of physical activity contributes between 14% and 23% to mortality (Hahn, Teutsch, Rothenberg, & Marks, 1986; McGinnis & Feoge, 1993). Also, a strong inverse relationship between physical activity and mortality has been demonstrated in both men and women (Kushi, Fee, Folsom, Mink, Anderson, & Sellers, 1997; Paffenbarger, Hyde, Wing, Lee, Jung, & Kampert, 1993). Colditz (1999) estimated that lack of physical activity contributes 22% to incidents of coronary heart disease, 12% to diabetes, and 12% to hypertension. Furthermore, he estimated that the direct costs associated with physical inactivity are between $24 and $37 billion, or 2.4% and 3.7% of U.S. health care expenditures respectively. Conversely, engaging in regular physical activity is associated with improvements in cardiovascular disease (Kohl, 2001), type II diabetes (Knowler et al., 2002), and a significant decline in all—cause mortality (Manson et al., 2002; Myers, Froelicher, Do, Parrington, & Atwood, 2002).

The health risks encountered by people who are physically inactive, overweight, or obese have prompted health agencies to promote physical activity. However, just promoting physical activity may not be sufficient to change the behavior of people who are physically inactive, overweight, or obese. The general benefits of being physically active are typically well known. Despite this, people continue to be physically inactive. Therefore, part of successfully promoting an activity is designing a message that is persuasive and that subsequently changes people's behavior. However, there has been relatively little research that has used theories of persuasion in promoting physical activity (Jones, Sinclair, & Courneya, 2003; Stubblefield, 1997). Instead, research has focused on the determinants of physical activity and designing interventions that promote physical activity. The theories that have been used to instigate behavioral change

typically are based on classical learning theory (Seefeldt, Malina, & Clark, 2002). The theory of planned behavior and the transtheoretical model, for example, have been used to design physical activity interventions (for review see Adams, 2003; Blue, 1995). However, these theories are based on individual health behavior and are not persuasion theories per se. The few studies that have used theories of persuasion have focused on source credibility and message framing and have produced conflicting results (Jones, Sinclair, Rhodes, & Courneya, 2004). Source credibility has been reported to influence how closely a message is processed and to also serve as a peripheral cue indicating the validity of a message (Chaiken & Maheswaran, 1994; DeBono & Harnish, 1988; Heesacker, Petty, & Cacioppo, 1983). A message positively framed (i.e., one that described the benefits of message compliance rather than the risks associated with message non—compliance) has been suggested as more effective in promoting prevention behaviors such as exercise (Rothman, Salovey, Antone, Keough, & Martin, 1993; Schneider, Salovey, Pallonen, Mundorf, Smith, & Steward, 2001). The reason for this is based in prospect theory (Tversky & Kahneman, 1981) which states that behaviors that prevent negative outcomes are considered to be risk adverse behaviors. With preventative behaviors people consider the gains; therefore, a message positively framed is considered to be preferable (Rothman et al., 1993).

Another method that is used to persuade is to evoke emotions in the message recipient. Emotions are internal, mental states that are evaluative, valenced reactions to events, agents, or objects that vary in intensity and are typically of short duration (Forgas 1992; Ortony, Clore, & Collins, 1988). Current thinking suggests that affect (which includes emotions and moods) is considered a source of information when making judgments (Schwarz & Clore, 1983). People will thus make decisions based on "how they feel." Research has suggested that with moods, affect—as—information is used as a

heuristic tool in information processing (Clore & Parrott, 1991; Schwarz & Clore, 1988). Indeed, messages that evoke negative affect have been shown to generate greater cognitive attention and scrutiny than have messages that evoke positive affect (Schwarz, 1991). A persuasive message that is successful in changing behavior (after having been carefully scrutinized) is also more likely to lead to more enduring attitude change than would a message that has only been processed peripherally (Petty & Cacioppo, 1986). Having an enduring favorable attitude would be considered important for a behavior that is required to be repeated on a continual basis. Exercise is one such behavior that needs to be performed repetitively and requires a life time commitment. Therefore, having a more enduring favorable attitude towards exercise may be important for promoting long term exercise behavior. In addition to the affect—as—information model, the affect—priming principle suggests that affect can influence social judgments indirectly by influencing how a message is processed, interpreted, and remembered (Bower, 1981; Isen, 1987). These two models are suggested to complement one another, rather than generating competing hypotheses (Forgas, 1995).

Information processing is an important part of the persuasion process. Various models of information processing in persuasion suggest that information is processed through two routes. These routes are hypothesized to represent two ends of a continuum. The first involves high elaboration, systematic or substantive processing (Chaiken, 1980; Chaiken, Liberman, & Eagly, 1989; Forgas[1], 1995; Petty & Cacioppo, 1986). The other pathway relies on heuristics and peripheral information for message processing. Although the way in which information is processed is an important component of persuasion, there is little research on how emotions may be involved in this process (Nabi, 1999). Indeed, there is considerable more research on the effects of moods, rather

[1] Forgas's (1995) Affect Infusion Model acknowledges four judgment strategies used in social judgments. However, under high affect infusion, which occurs with emotions, only two are considered to be utilized.

than emotions, on persuasion (for review see Hullett, 2005). In addition, research in this area often uses the terms "affect", "emotion", and "mood", interchangeably (Hullett, 2005). Moods, however, differ from emotions in that they are of lower intensity and typically do not have a salient antecedent cause (Forgas, 1992). Mood and emotion research has further simplified these constructs by defining them as being either positive or negative (McGuire, 1985; Petty, DeSteno, & Rucker, 2001). However, individual emotions are considered to have distinct situational appraisal patterns that serve adaptive purposes and influence cognitive and motivational processes (Damasio, 1994; Frijda, 1986; Herrald & Tomaka, 2002; Keltner & Gross, 1999; Lazerus, 1991). Discrete emotions will cause situations to be appraised differently and therefore message processing can be influenced by the emotions that the message directly evokes (Nabi, 1999). Consequently, it would seem appropriate for research on the effects of emotions on persuasion to examine discrete emotions rather than a dichotomous positive—negative definition. Despite this assertion, the only discrete emotion that has received considerable empirical enquiry in persuasion research is fear (Breckler, 1993; Nabi, 1999).

Research on fear and persuasion has often been in the context of health promotion. With health promotion the 'scare tactic' has been a popular means to influence behavior. Campaigns to stop smoking, for example, have scared people by informing them of the diseases and lower mortality associated with smoking. A closer examination of these scare tactics reveals that they often include the use of disgusting images. Disgust, it seems, facilitates fear and makes the message more frightening or more novel (Witte & Allen, 2000). However, in these circumstances, fear is still the dominant emotion evoked. Furthermore, scarier messages appear to be more persuasive,

particularly when specific recommendations are included in the message and the recommendations are believed to be achievable and effective (Witte & Allen, 2000).

Both fear and disgust motivate an avoidance action tendency (Lazerus, 1991). An action tendency is the physiological response pattern that an emotion generates. In the case of fear and disgust, the appraised situation motivates the individual to avoid the situation. Fear thus motivates flight, while disgust motivates a desire to avoid contact with the offending object. However, disgust also attracts attention and begs for further elaboration. People are often curious of what they find disgusting and subsequently disgust can be alluring. Furthermore, disgust has a lingering effect and appears to be more memorable than other emotions (Englis, 1990). With repetitive behaviors such as exercise, it may be important for people to be reminded of the importance of continuing the behavior. Indeed, memory storage of the content of a persuasive message is considered an important component for long term attitudinal and behavioral change (McGuire, 1989). The ability to gain attention and to remain memorable would seem to make disgust a suitable emotion for a persuasive message. Disgust is frequently used in making moral evaluations and shaping behavior, social norms, and cultural identity (Looy, 2004). Disgust can therefore attach value to behaviors. This is important as values are more enduring than preferences, more central to the self, and more internalized (McCauley, Rozin, & Schwartz, 1995 as cited in Rozin, Markwith, & Stoess, 1997).

Disgust appears to be an emotion that gains people's attention, motivates a strong behavioral response, is memorable, enduring, and in part, defines social norms. Given these characteristics, disgust may be a suitable emotion to use in a persuasive health promotion message designed to target the physical inactive, overweight, and obese. In addition, while the effects of fear appeals have received considerable empirical enquiry since the 1950's, research on the use of disgust in a persuasive context is extremely

sparse. To illustrate, the latest meta—analysis of fear appeals included over 100 articles (Witte & Allen, 2000). In contrast, there have been very few articles that have investigated the direct use of disgust in a persuasive context. These articles suggest that disgust may be effective in persuasion yet there is still little known regarding the way in which disgust is processed. This study investigated whether disgust can be used to promote physical activity and the way in which disgust is processed. In addition, because disgust is often used in combination with fear appeals, this study also examined the effects of messages that combine fear with disgust.

STATEMENT OF PURPOSE

This study had three main purposes. First, the study sought to determine the effect of messages that combine stimuli that evoke fear and disgust. In particular, the study sought to determine if the inclusion of a disgusting image in a health message promoting physical activity magnified feelings of fear.

Second, this study sought to determine the way in which disgust and fear messages are cognitively processed. This involved determining whether disgust messages gained greater attention than non—disgust messages. In addition, the way in which disgust and fear effect memory was also determined. Specifically, it was determined whether messages that evoke disgust and fear were better remembered than messages that did not evoke disgust or fear. Furthermore, this study sought to determine which information processing pathway, either central or peripheral, was used to process disgust and fear messages.

Third, the study sought to determine the effects of health messages that evoke disgust and fear have on behavioral outcomes. In particular, people's physical activity behavior, information seeking behavior, fitness test enrollment, and social diffusion behavior were investigated to determine if disgust and fear evoking messages augmented

the outcomes of these dependent variables. This study also sought to determine how the emotional tone of the message affects theses dependent variables and how disgust and fear interact. Finally, this study sought to determine whether the persuasion process depends upon the relevance of the message, individuals' sensitivity to disgust, age, ethnic background, gender, and education level.

An additional purpose of this study was to determine whether disgust could be separated into different types of disgust. Disgust is a multifaceted emotion and it can be evoked in different ways. Different types of disgust may have different effects on the dependent variables mentioned previously. Therefore it was considered important to know exactly what type of disgust this study addressed. Pilot studies were conducted to determine whether, from a physical activity perspective, different types of disgust could be measured.

RESEARCH QUESTIONS

This study sought to investigate the following research questions:

1. Can disgust evoking images designed to influence physical activity be quantitatively differentiated into different types of disgust?
2. Does the presence of a disgusting image in a health message augment the experience of fear?
3. Do messages that include disgusting images better capture attention than messages that do not include disgusting images?
4. What effects do messages that evoke disgust and fear have on memory?
5. Which information processing pathway do messages that evoke disgust and fear favor?
6. Does a disgust evoking message promoting physical activity lead to greater adoption of message recommendations compared with non—

disgust evoking messages? How does this compare with fear evoking messages?

7. Does a disgust evoking message promoting physical activity lead to greater information seeking and more social diffusion than a non—disgust evoking message?
8. Does the combination of disgust and fear in a health message make the message more memorable, or augment behavior outcomes (physical activity behavior, information seeking, and social diffusion)?

SIGNIFICANCE OF STUDY

This study was significant for several reasons. First, the distinct nature of disgust and fear was clarified. In particular, this study supports the contention that research on emotions should focus on discrete emotions rather than use dichotomous labels that simplify emotion into positive and negative constructs. Second, this study provides support for the efficacy of emotions to change behavior, particularly in relation to physical activity. Third, this study highlights the processes by which disgust and fear impact cognitive processing. Finally, this study is significant in that it offers practical insights into how an effective health communication campaign can be designed.

DELIMITATIONS

This study was delimited to employees of the University of Texas at Austin. Participants were a minimum of 18 years of age and were able to read English. Health promotion material was delimited to evoke animal—reminder disgust, moral disgust, fear or a neutral emotional response. The effects of the health promotion material were assessed over a 16 day period.

LIMITATIONS

This study used employees of the University of Texas at Austin. This sample may not be representative of people residing in the State of Texas or beyond. Subsequently, caution should be used when generalizing the results of this investigation.

Health promotion literature used in this study was written only in English. Participants who do not have English as a first language or have poor reading skills may not interpret the material as intended. Participants were exposed to the health promotion during only one visit to the Sport Development Laboratory.

Only the short term effects (16 days) of the intervention were monitored. It is therefore not possible to determine the sustainability of any outcomes from the intervention nor to detect the presence of a sleeper effect.

The use of self report questionnaires may limit the study results due to over—or under—reporting of behaviors, attitudes, beliefs and feelings. However, in terms of determining emotional state, self report is widely accepted as a reliable indicator (Frijda, 1988; Lang, 1995). Moreover, Mewborn & Rogers (1979) have reported that self—report measures of emotions are superior to physiological measurements. This study incorporated the use of a physiological measure and multiple behavioral observations, which, combined with the use of self—report materials further, validates the findings from this study.

SUMMARY

Concern over the rising number of overweight, obese, and physical inactive people has been increasing for some time. Despite the well known benefits of regular physical activity there is still a large percentage of individuals who are not sufficiently physically active. To address this problem health promotion campaigns have been used to promote physical activity. The effectiveness of health promotion campaigns relies on

the persuasiveness of the message. One strategy to design a persuasive message is to influence emotions. These emotions are cognitively appraised and motivate a behavioral response. Disgust is an emotion that may be suitable for using in a persuasive message. Disgust appears to attract attention, is memorable, appears to influence social norms, determines immorality, and is a strong motivator of avoidance behavior. However, disgust has received little empirical enquiry. This research study investigated whether disgust can be an effective emotion to promote physical activity. Specifically, this research study examined the effect disgust has on cognitive processing and on behaviors related to physical activity. Finally, because of the historical use of disgust to magnify fear in many health communications, this study examined and compared the effectiveness of messages designed to evoke disgust and fear, and the combination of disgust and fear.

Chapter Two: Review of Literature

There has been a continual increase in the number of overweight and obese individuals in the U.S. for the last 20 years (CDC, 2005a). Current estimates indicate that over 60 million Americans over the age of 20 are obese. Furthermore the trend of increasing numbers of overweight and obese people shows no indication of abating. This is a major concern because numerous health problems are associated with being overweight or obese. Along with these problems comes an increase in health care expenditures (Wee et al., 2005) which places a financial burden on the medical community and the tax payer.

Physical activity has been shown to be an effective means to control body weight. However, fewer than 50% of Americans engage in sufficient physical activity to derive health benefits. Moreover, 25% of Americans do not engage in any leisure time physical activity (CDC, 2005c). Concern over body weight and low levels of physical activity has prompted government agencies, for example the Center for Disease Control, to promote physical activity. Part of promoting any activity is the process of designing a message that will persuade people to adhere to the message's recommendation. A message is a communication between sources (a sender and a receiver) and may include written text, visual images, and sounds such as spoken words. In the context of this study, a message is considered a written document which may or may not include visual images. In designing these messages one would assume that theories of persuasion would be used in the process. However, there is little research on the promotion of physical activity using theories of persuasion (Jones et al., 2003; Stubblefield, 1997). Research that has used theories of persuasion has focused on source credibility and message framing. Jones et al. (2003), for example, demonstrated that a positively framed message when presented

by a credible source was more effective in promoting exercise intentions and behaviors than a negatively frame message presented by a non—credible source. However, in a follow up study, Jones et al. (2004) found no effect of source credibility or message frame on exercise intentions. The findings of these two studies suggest that source credibility and message frame alone are not enough to adequately promote physical activity. Instead, other theories of persuasion need to be investigated to determine whether they can successfully promote physical activity. In order to do so it would seem appropriate to first understand exactly what persuasion entails.

Persuasion is "a successful intentional effort at influencing another's mental state through communication in a circumstance in which the persuadee has some measure of freedom" (O'Keefe, 2002, p. 5). In persuasion, the mental state that is thought to be influenced is one's attitude, where attitude is defined as a person's general evaluation of an object. In this context, "object" is used broadly and can include items, events, and people. It is assumed that attitudes are an important determinant of behavior (O'Keefe, 2002). In order for an individual to be persuaded he or she must be exposed to a persuasive message and attend to it. In addition, the individual must become interested in the message and comprehend the message (McGuire, 1989). These steps are prerequisite to attitude change and any subsequent behavioral change. One means of gaining an individual's attention in order to change their attitude is through the use of emotions (McGuire, 1985).

Emotions are internal mental states that are evaluative, valenced reactions to events, agents, and objects, that vary in intensity and are typically of short duration (Forgas 1992; Ortony et al., 1988). Persuasive messages often purposely evoke particular emotions, such as humor or fear. The use of emotions appears to be a popular means to persuade, particularly in a marketing and advertising context. Emotions have been

suggested to act as information that is cognitively processed and subsequently does, or does not, lead to acceptance of a persuasive message (Nabi, 1999; Petty, Cacioppo, Sedikides, & Strathman, 1988). However, theories of cognition have often considered emotions as distracters to normal thinking processes (Forgas, 1995). Even popular theories of cognitive processing of messages, such as the Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1986), offer only a post—hoc explanation of the way that emotions affect cognition (Nabi, 1999). Still, emotions have been shown to be an effective means of directly influencing behavior and attitudes (Witte & Allen, 2000). With the exception of research on fear evoking messages, there has been little research examining the ways in which discrete emotions influence behavior and attitudes. Disgust is one emotion that has not received considerable empirical enquiry. To illustrate, in a recent review of literature related to disgust Olatunji and Sawchuk (2005) acknowledge that while research on fear has steadily grown over the last four decades, research on disgust has remained almost stagnant. However, disgust is an emotion that has a strong protective function (Lazerus, 1991), and so may be a persuasive tool for promoting healthy behavior.

Despite the assertion that disgust is a strong motivator, disgust has essentially been ignored by the academic community (S. Miller, 2004; Olatunji & Sawchuk, 2005). Susan Miller (1993) explains "The essence of disgust is rejection of contact and the [academic] field has responded to the emotion by rejecting contact" (p. 711). Researchers of anxiety disorders (McNally, 2002), anthropology, psychology, philosophy (W. Miller, 1997), eating disorders (Troop, Treasure, & Serpell, 2002), folklore (Jones, 2000), persuasion (Nabi, 1998, 1999), psychiatry (Phillips, Senior, Fahy, & David, 1998), advertising and marketing (Shimp & Stuart, 2004) have all acknowledged this lack of enquiry. The paucity of empirical research on disgust is surprising, as disgust is relevant

to all these fields and is a common emotion experienced in everyday life. In fact, it is perhaps the pervasiveness and strong behaviorally motivating nature of disgust that makes disgust an influential emotion in shaping and defining our culture and social norms (Looy, 2004).

The pervasiveness of disgust is demonstrated by the frequent use of disgust in health communications and advertising. Anti—smoking advertisements often use visuals such as diseased lungs, to make people more fearful of smoking related cancer. In the fast food industry, Subway restaurants show competitors' products looking sloppy and then reveal the fat content of these products. Just to make sure that disgust is conveyed, there is a close up of Subway's spokesperson making a classic disgust face. Everyday consumer products are also promoted by evoking disgust in consumers. Clorox bleach, for example, ran a series of commercials where a spokesperson would 'gross people out' by showing the accumulation of dead skin from bed sheets not washed with their product. Even their website has a page devoted to explaining how "Yucky stuff like germs, bacteria, and body soil" (Clorox.com, 2005) accumulates in detergent laundered clothes. These examples illustrate the use of disgust to motivate behavior by labeling one outcome as disgusting and providing an alternative behavior that avoids the disgusting outcome. So, not smoking avoids diseased lungs; eating Subway sandwiches avoids eating fatty sloppy burgers; and using Clorox prevents you from sleeping on dead skin. However, the question that is raised is whether disgust is actually successful in motivating the desired behavior.

The remaining literature review first presents an overview of the historical development of disgust research. This overview serves to explain the current meaning and understanding of the emotion disgust. This is considered important because disgust is a complicated and sometimes contradictory emotion. Having a thorough understanding

of this emotion facilitates empirical enquiry and interpretation. The literature review then examines previous research that has used disgust as a means to amplify fear. Specific research on the use of disgust in communication is then explored. The way that disgust is cognitively processed is examined; this is accompanied by an insight into the complex and perhaps contradictory nature of disgust. Nabi's (1999) cognitive—functional model for the effects of discrete negative emotions on persuasion is then introduced along with a discussion on the potential role of disgust within this model. Finally, hypotheses generated from this literature review are presented.

HISTORICAL PERSPECTIVE ON DISGUST RESEARCH

The emotion disgust was first afforded serious enquiry by Charles Darwin in his book, *The Expressions of the Emotions in Animals and Man* (1872/1965). Darwin considered disgust at its core to be "something offensive to the taste" (p. 256). He further described disgust as "something revolting, primarily in relation to the sense of taste, as actually perceived or vividly imagined; and secondary to anything that causes a similar feeling, through the sense of smell, touch, and even of eyesight." (p. 253). Although Darwin acknowledged that other senses can be involved with disgust, taste was primarily associated with disgust. This is not surprising considering that the etymology of disgust is "bad taste". Darwin further described the facial expressions that accompany disgust which served to reject food. The universality of this facial expression and of the experience associated with the emotion of disgust has since been demonstrated by the research of Ekman and Friesen (1975) and Izard (1971).

Andras Angyal published the next scientific investigation into the concept of disgust nearly seventy years later in 1941. Angyal used self—observation, observation, and discussion to explore the meaning of disgust. He acknowledged that certain substances that are soft, sticky or slimy were considered disgusting. Furthermore, the

intensity of felt disgust increased with the degree of intimacy of contact. In particular, he found that waste products of the body (both human and animal) evoke disgust, with feces being the primary disgust substance. Angyal considered the majority of disgusting substances to be animal in nature. This disgust, he argued, centered on inferiority rather than the concrete sensory qualities of these substances. He wrote:

> The nature of the repulsion, which one experiences with regard to the wastes of our body is related to the meanings which are attached to them…These substances do not imply obvious noxiousness but merely and essential inferiority and meanness. (p. 401)

Disgust in this context creates a hierarchy with humans placed above animals. Thus anything that is animal in nature is considered demeaning and to be avoided.

Consistent research on disgust began in the 1980's. Expanding the work of Darwin and Angyal, Fallon and Rozin (1983) further described disgust as an ideological response to something that is offensive by its nature rather than by its sensory qualities. In many cases it is not objects per se that are disgusting but the contexts and meanings applied to these objects (Rozin & Fallon, 1987). An additional feature of Rozin and colleagues' conceptualization of disgust is that disgust is subject to the laws of sympathetic magic. In particular, the law of contagion states that contact with disgusting stimuli is continuous into other environments and situations. In simpler terms this means once in contact, always in contact. This is illustrated by reports that people are more reluctant to drink freshly poured juice in a new glass after a previous glass of juice has been stirred with a sterilized cockroach (Rozin, Millman, & Nemeroff, 1986). In addition, the law of similarity states that items that resembles one another share fundamental qualities. Thus, if it looks like something disgusting, then it must be that

disgusting item. This has been demonstrated by reports that people are more reluctant to eat chocolate fudge that has been shaped to resemble dog feces (Rozin et al., 1986).

This conceptualization of disgust, from Darwin, Angyal, and Rozin's early work, has been termed "core disgust" (Rozin, Haidt, & McCauley, 2000). Disgust, however, has evolved to include reminders of our animal—nature and certain moral offenses. This led to the development of a stage theory of disgust with core disgust, animal—nature disgust, interpersonal disgust and moral disgust comprising the different stages (Rozin et al., 2000). These different stages represent the evolution of the meaning of disgust over time. The stages, in effect, represent different categories and interpretations of disgust. Incorporated in these stages are nine domains of disgust, namely: food, body products, animals, sexual behavior, contact with death or corpses, violations of the exterior envelope of the body (including gore and deformity), poor hygiene, interpersonal contamination (contact with unsavory human beings), and certain moral offenses (Haidt, McCauley, & Rozin, 1994; Rozin, Haidt, McCauley, & Imada, 1997). Each of these domains contains similar stimuli that will evoke disgust. For example, body products would encompass sweat, spit, excrement, and urine. Rather than describe an inventory of each domain, the next section focuses on the different categories of disgust and examines these different categories that cause us to experience disgust.

CATEGORIES OF DISGUST

Animal—nature disgust suggests that we are motivated to 'humanize' activities that remind us of our animal—nature (Rozin & Fallon, 1987). Being reminded of our animal—nature is hypothesized to relate to mortality concerns (Becker, 1973; Rozin et al., 2000). Becker (1973) originally proposed that acknowledging our commonality with animals also acknowledges that like animals, we are subject to death and decay. In fact, sensitivity to disgust has been shown to be positively correlated with fear of death (Haidt

et al., 1994). Terror management theory (Solomon, Greenberg, & Pyszynski, 1991) advances Becker's work and explains that the body is problematic because it reminds us of our animal—nature and subsequent limitations (Goldenberg, Pyszczynski, Greenberg, Solomon, Kluck, & Cornwell, 2001; Solomon et al., 1991). Violations of the exterior envelope of the body are therefore particularly disgusting and threatening as they serve to remind us of our own mortality (Rozin et al., 2000). It is therefore common for meat to be prepared to hide its animal origins and even to change the name, such that pig meat becomes pork (Anygal, 1941). In addition, society promotes norms that distinguish people from animals (Goldenberg et al., 2001). We mask how we smell and remove body hair in order to aspire to objects of beauty. Furthermore, animal words are often used as insults (Rozin, Haidt, & McCauley, 1999). Although cultures may differ in what norms they promote, all cultures have standards that elevate us above animals (Goldenberg et al., 2001). In fact, it was Ortner (1973) who originally acknowledged that tears, which are unique to humans, are the only bodily excretion not considered disgusting.

This animal connection has, however, come under some criticism. Royzman and Sabini (2001) recognize that we share other characteristics with animals that are not considering disgusting, for example, breathing or orientating towards sound. While it may be an expression of disgust to call someone an animal or some other animal term there are a numerous examples of positive incarnations of animal words. Being wise as an owl or as strong as an ox are all examples of desirable qualities. Furthermore, people often ascribe to the belief that "you are what you eat" such that positive qualities of consumed animals are transferred to the recipient (Nemeroff & Rozin, 1989).

W. Miller (1997) takes a different perspective on the animal—nature connection. He argues that body envelop violations are disgusting because of the inappropriateness of

destroying the integrity of the body's seal. In addition, he believes "it is not that animal bodies decay, excrete, suppurate, and die that makes these processes sources of disgust to us: it is that ours do." (p. 49). He further explains:

> What the animals remind us of, the ones that disgust us– insects, slugs, worms, rats, bats, newts, centipedes- is life, oozy, slimy, viscous, teeming, messy, uncanny life. We needn't have recourse to the animals for that reminder; all we need is a mirror. (p. 50)

In essence, Miller argues that it is nature, rather than animal—nature that evokes disgust, and animals just happen to be part of nature. Likewise, dead bodies evoke disgust because they are disgusting in and of themselves, rather than as some reminder of our animal origins and subsequent mortality.

The next category of disgust moves beyond animal connections and focuses on interactions among people. Interpersonal disgust is evoked by physical contact, either directly or indirectly, with strangers or undesirable people (Rozin, Markwith, & McCauley, 1994). This category again draws upon the laws of sympathetic magic. For example, people are reluctant to wear a laundered sweater that was previously worn by a criminal (Rozin et al., 1994).

Moral disgust is the final category of disgust. Haidt and colleagues discovered that across cultures people often equate disgust with immorality (Haidt, Rozin, McCauley, & Imada, 1997). When asked to list things they find disgusting, people think of, among other things, child molesters, hypocrites, and racists. Emotional reactions such as disgust have been shown to be the best predictors of moral evaluations (Haidt & Hersch, 2001; Haidt, Koller, & Dias, 1993). It is these evaluations that help to regulate moral behavior and develop cultural identity (Looy, 2004). Disgust in particular helps to

"facilitate evaluations of good and bad, rightness and wrongness, and to motivate and direct behavior away from the bad" (Looy, 2004, p. 222). Disgust therefore differentiates, ranks, and segregates people and then maintains these hierarchies.

Disgust has also been shown to be connected with divinity code (i.e., purity and sanctity) violations (Rozin, Lowery, Imada, & Haidt, 1999). It has subsequently been described as the body and soul emotion that serves to defend the purity of the body, soul, and even the social order itself (Rozin et al., 2000). Disgust has also been suggested as a means by which we preserve our humanity (Haidt et al., 1997). These associations with morality and divinity make disgust influential in negative socialization and maintaining cultural values (Looy, 2004; Rozin, 1982; Rozin, Haidt, McCauley, Dunlop & Ashmore, 1999). Emotions attach value to actions and values, in and of themselves, are a form of moral judgment (Damasio, 1994). The process whereby a preference, such as smoking, becomes a value is termed, "moralization" (Rozin, Markwith, & Stoess, 1997). The evolution of a preference to a value is important because values are more durable than preferences. Furthermore, values tend to be more internalized and become part of our identity (McCauley, Rozin, & Schwartz, 1995). Subsequently, people may label themselves as a 'non—smoker', for example. Disgust as a moral emotion can therefore have a dramatic impact on moralization, and individual and cultural values. Further evidence for this enculturation effect is that feral humans, who have lacked social interaction, also fail to develop the disgust response (Malson, 1964). In fact, children typically do not express or experience disgust until after four, and sometimes as late as eight, years old (Fallon, Rozin, & Pliner, 1984; Rozin & Fallon 1987; Rozin, Fallon, & Augustoni—Ziskind, 1985).

W. Miller (1997) elaborates on the evaluative nature of disgust when he states that a typical moral sentiment is that people we find disgusting do so willingly. So, "The

obese are thus fat because they are unwilling not to be" (p. 203). W. Miller also suggests that we have a fat phobia and that fat, in and of itself, is disgusting. Jones (2000) concurs when he writes that being overweight is viewed as a demonstration of a lack of self—control and equates it with the sin of gluttony. Displaying some form of disgusting behavior, whether it be smoking or just being overweight, is attributed to personal choice rather than to situational factors. Statements such as these demonstrate how disgust can create stigmas.

STIGMA

A stigma is a socially constructed membership into a devalued group (Brown, Macintyre, & Trujillo, 2003; Dovidio, Major, & Crocker, 2000). In addition, stigmas contain easily identifiable distinguishing characteristics or marks. Features, such as excess body fat, are distinguishing characteristics and can subsequently create group membership. This group membership can evolve to create negative stereotypes (Ashmore & Del Boca, 1981). The opinion that 'all fat people are greedy' would be a common stereotypical inference. The creation of stigmas using moral as well as other forms of disgust is surprisingly common in the health promotion literature. Smith and Miller (in press) report that 59% of viewed health promotion literature used a stigma format that evoked disgust or shame. In addition, in accordance with W. Miller's (1997) and Jones's (2000) observations, Smith and Miller (in press) reported that 53% of health promotion messages attributed the health problem to the person's individual choice. Looy (2004) acknowledges that disgust, in this context, can be used as a basis to deem what is immoral. Although Looy (2004) argues that disgust should not be used in this way, she has not considered how disgust could be used to promote positive cultural values. Smoking, for example, has evolved from an accepted, even admired, behavior to

one that is now considered disgusting. Smoking has therefore become a moral issue for many.

It is interesting to note the evolution of anti—smoking campaigns. Early anti—smoking communications sometimes used animal—nature disgust as a means to increase fear. Pictures of diseased lungs and images of death, such as coffins, were used to combat smoking behavior. More recently, anti—smoking campaigns, such as "The Truth," make more use of moral disgust evoking material rather than just using animal—nature disgust. "The Truth" campaign commercials are often designed to makes us feel disgust towards tobacco companies. For example, several commercials provide details of tobacco companies' use unflattering labels (e.g., "emotionally unstable" and "problems with self—esteem") to target consumers as well as then enormous spending on advertising compared with little reinvestment in the community. These types of commercials are designed to make the consumer feel disgust towards the tobacco company because of its immoral (and therefore disgusting) behavior. The evolution of anti—smoking campaigns suggests that the elicitation of different types of disgust (i.e., animal—nature and moral) may be used to influence attitudes and, possibly, to change behavior. These two types of disgust (animal—nature and moral) appear to be conducive to promoting healthy behaviors, such as not smoking. Animal—nature disgust can be used to illustrate negative outcomes associated with unhealthy behaviors; moral disgust can be used to define morality and to create social norms.

While the mere use of disgust inducing messages does not prove effectiveness, the ubiquity of these messages in health related campaigns raises some interesting questions. First, do messages that evoke disgust affect attitudes and/or behavior? In effect, are these types of messages successful in their objective of changing attitudes and behavior in the desired direction? Second, does one type of disgust have a greater impact

than the other? This study therefore investigates whether animal—nature and moral disgust are equally effective in successfully promoting physical activity. This study focuses on these two types of disgust because it is unlikely that the other forms of disgust would be used to influence physical activity. Core disgust is based primarily on taste, and interpersonal disgust is focused on interactions among people. In addition, it has been acknowledged that disgust is sometimes used as a means to increase fear. This raises the question of the relationship between disgust and fear, and whether disgust can be as effective as fear in influencing behavior. To help address this observation the use of disgust to magnify persuasive messages designed to evoke fear is briefly explored.

DISGUST AND FEAR MESSAGES

Health promotion messages often attempt to influence attitudes and behavior by eliciting fear in their target population. The rationale for this approach is that eliciting fear will motivate the message recipient to adopt the recommended behavior as a means of removing the potential threat. Thus, not smoking removes the potential threat of developing cancer. A cursory examination of health—related fear messages reveals that disgust invoking imagery often accompanies these messages. In research studies, disgust has been used as a means to differentiate between high and low fear experimental conditions. These include studies relating to dental hygiene (Beck & Lund, 1981; Janis & Feshbach, 1953), cancer (Insko, Arkoff, & Insko, 1965; Leventhal & Watts, 1965; Rogers & Mewborn, 1976), roundworm infestation (Chu, 1966), safe driving (Leventhal & Trembly, 1967; Rogers & Mewborn, 1976), and sexual transmitted diseases (Rogers & Mewborn, 1976). In these studies, the high fear condition used disgusting images that were designed to magnify fear and the message sometimes included language that was personally threatening (i.e., "if *you* don't clean your teeth then *you'll* suffer painful consequences"). These images included gruesome pictures and video footage that

depicted body envelope violations and/or diseased body parts. Janis and Feshbach (1953), for example, showed slides of diseased gums during a fifteen minute presentation while Rogers & Mewborn (1976) used a video showing the gory aftermath of car crashes in their high fear condition.

A common misconception is that highly fearful messages are not effective in changing attitudes and behaviors (Witte & Allen, 2000). Fearful and graphic images are thought to distract people from message processing or cause reactance, thus creating a boomerang effect. Janis and Feshbach's (1953) dental study article has frequently been offered as an example of the inferiority of a high fear (and high disgust) health communication when compared to a moderate or low fear communication. In their study, students who attended a low or moderately fear inducing presentation reported greater increased conformity to dental hygiene recommendations than did students who attended a high fear inducing presentation. However, Janis and Feshbach (1953) also reported that high fear communications were as effective as low and moderate fear communications in gaining attention and teaching factual information. Furthermore, participants in the high fear group felt that the presentation did not contain enough information (which may be indicative of information seeking behavior). Although the high fear group reported lower conformity than the low fear group to adopting the behavioral recommendations, this is probably a function of either their perceived efficacy to perform the behavior and prevent disease, or the believability of the seriousness of oral hygiene. In this study, participants in the high fear condition were informed that poor oral hygiene can lead to infection, kidney damage, arthritic paralysis, and blindness. Moreover, as Janis and Feshbach (1953) acknowledge, when fear is aroused and there is not adequate reassurance that the performed action will remove the threat, then "the audience will become motivated to ignore or to minimize the importance of the threat" (p. 90).

Conflicting results of communications inducing high levels of fear persisted during the mid and late 20th century. Consequently there have been several literature reviews published to examine whether high fear communications are effective, and if so, under what conditions. Higbee (1969) concluded that high fear communications are more effective than low fear communications in persuading participants to change behavior. In addition, Higbee (1969) identified different types of fear, one of which he termed, "nausea—type fear." This he described as, "a nauseated, sick feeling aroused by gruesome, vivid descriptions and pictures" (p. 434). There appear to be parallels between this description of fear and that of disgust. The term, "nausea" is often used in manipulation checks to determine the effect of communications. In this context, nausea is considered a component of fear, rather than of another emotion, such as disgust. When Leventhal & Trembly (1967) measured individual emotions they reported that self—reported disgust was higher in a high fear inducing communication condition. Leventhal (1971) later stated that fear inducing communications can evoke other emotions, in particular disgust. Fear and disgust can therefore be evoked by a communication designed to induce fear. This raises the question of whether disgust can lead to the same, or more desirable, behavioral outcomes.

Later reviews of literature all confirmed Higbee's conclusion that high fear is more effective than low fear in influencing attitude and behavior change. Meta—analysis by Boster and Mongeau (1984), Mongeau (1998) and Witte and Allen (2000) all reported modest and reliable relationships between the strength of a fear inducing communication and subsequent attitude and behavior change. Witte and Allen (2000) also reported that the biggest contribution to perceptions of fear is manipulations that magnify its severity. They suggested that this is achieved by showing vivid and gruesome pictures which may make the negative behavioral outcomes more salient and tangible. It would therefore

appear that the relationship between fear and disgust is one in which disgust moderates the magnitude of perceived fear.

Further, Witte and Allen (2000) confirmed that the most effective messages are those that evoke not only a high level of fear, but also a high level of perceived efficacy. It is therefore not sufficient for a message to induce fear. The message must also communicate that the recommended response will remove the fear and that the message recipient has the ability to successfully perform the recommended response. The importance of perceived efficacy has been demonstrated with smoking cessation, protective sex, safe driving (Rogers & Mewborn, 1976), and exercise promotion (Plotnikoff & Higginbotham, 2002).

The preceding section serves to reaffirm fear messages that include high levels of perceived efficacy can be effective in promoting healthy behaviors. These fear messages have often used disgust as a means to magnify experienced fear. Disgust is therefore a moderator of the magnitude of experienced fear. However, this does not answer whether disgust can uniquely influence behavior. In addition, if disgust can influence attitudes and/or behavior, how do disgust eliciting messages compare with messages that elicit fear? To begin to answer these questions one must first explore research on disgust and communication.

DISGUST AND COMMUNICATION

Specific research on disgust and communication is sparse. Research by Englis (1990) and Lang and Newhagen (1996) suggest that TV advertisements and news programs that include disgust are more memorable. Gaining attention and producing memorable messages are important components of a persuasive message that could potentially influence behavior (McGuire, 1989). However, the way that disgust is used

and framed in persuasive messages can affect the desirability of the message's recommendation.

Lerner, Small and Loewenstein (2004) report that felt disgust can influence selling and buying prices even when the felt disgust is irrelevant to the consumable. In their study, participants had disgust and sadness emotion inductions before taken part in a selling or buying exercise. The participants placed in the disgust induction placed significantly lower selling and buying prices on a set of highlighters. The authors suggested that experienced disgust was transferred to the highlighters. This subsequently increased their motivation to either part with or not purchase the highlighters. This study serves to demonstrate how feelings of disgust can, even indirectly, influence behavior. One would assume that attempts to create a direct association with disgust and a product, service, or recommended behavior would not be desirable as this would motivate the opposite of the message's intent. However, this is precisely what some advertisers do, albeit inadvertently.

Shimp and Stuart (2004) acknowledge that in efforts to portray a food product's freshness, advertisers will show images of live animals and raw meat. Images such as these are potential disgust elicitors. Their study examined the effect images such as these have on purchase intentions. Participants watched commercials for a fictional fast food restaurant advertising a beef or chicken sandwich. In the experimental condition, images of raw meat were included in the commercial. Participants who watched these commercials had significantly more disgust thoughts, felt more disgust, and were less likely to purchase the sandwich. In a follow up study, Shimp and Stuart (2004) also reported that consumers often have disgust reactions to commercials which the advertiser did not intend. Gatorade, for example, ran a series of advertisements that showed people sweating while playing sports. Their sweat was depicted in the same fluorescent colors

that are used for Gatorade. Some consumers equated this image with the product tasting like sweat. Commercials that elicit disgust can lead to consumer complaints and subsequent banning or removal of these commercials. In England, for example, KFC received a record number of complaints for a commercial depicting people eating with their mouths full (Born, 2005). This commercial, which was supposed to be humorous, illustrates the difficulty of using disgust in a persuasive message. If a persuasive message is designed to elicit disgust, then disgust must be associated with the behavior that the message is trying to eliminate. Thus, we should attach disgust to *not* engaging in physical activity. This strategy directs behavior away from the current, problematic behavior. Although this strategy appears relatively simple, implementing it is more difficult than first thought. Nabi (1998) experienced such problems with her study examining the use of disgust to influence attitudes towards animal experimentation.

In Nabi's study, participants watched a video advocating animal experimentation. The video presented a two—sided argument along with either high or low disgust eliciting images. Each video included a counter argument opposing animal experimentation and a rebuttal favoring animal experimentation. Each included either high or low disgust eliciting images. In the high disgust counterargument manipulation, for example, participants watched images of a monkey being inflicted with head injuries. In contrast, the high disgust rebuttal featured images of deformed babies, which it was argued could have been prevented with animal experimentation. Therefore, the rationale was that *not* supporting animal experimentations leads to greater incidents of deformed babies. Participants' attitudes towards animal experimentation were recorded before and after watching the video. Results indicated that the video was counterproductive in promoting attitudes favoring animal experimentation. The design of this experiment was problematic in that competing disgusting images were used. Even in the low disgust

counterargument—high disgust rebuttal video, participants witnessed images that would have evoked pity (seeing a monkey with a tube going into its mouth) and disgust directed at the experimenters. Nabi (1998) acknowledges that it is unlikely that advertisers would intentionally use disgust to denigrate their own positions. However, this further illustrates how the context in which disgust is used must be carefully planned. An additional finding from Nabi's (1998) study is that disgust can be the most dominant emotion evoked from a persuasive message. In addition, Nabi (2002) has reported elsewhere that researchers need to be aware of different terminology when designing experiments. In particular, she observed that the lay meaning of disgust appears to be a combination of disgust and anger. This is perhaps more closely aligned to moral disgust, an observation that Nabi (2002) acknowledges. In support, Rozin, Haidt, and McCauley (1999) have reported a close relationship between moral disgust and anger. Furthermore, researchers who have examined the emotional profile produced by disgust elicitors have reported that moral disgust elicitors result in greater experience of anger and sadness (Marzillier & Davey, 2004; Simpson, Carter, Anthony, & Overton, 2006). Thus the layperson's understanding of disgust appears to be a combination of emotional experiences. In contrast, the theoretical concept of disgust appears to be more closely related to the slang term, "grossed out." In reality, this distinction demonstrates that people experienced different types of disgust. Furthermore, these types of disgust produce different affect.

The above discussion serves to highlight the difficulty in experimental design and terminology in disgust research. Previous research (Witte & Allen, 2000) has shown that disgusting images combined with a fear campaign can be effective in influencing behavior. A recent case study illustrates how disgust, as the primary emotion elicited, can influence behavior. In Canada, cigarette packets included graphic pictures that cover

over 50% of the packet. Hammond, Fong, McDonald, Brown, and Cameron (2004) conducted a 3 month longitudinal telephone survey to observe the impact of these packets on smoking behavior. Results from this study indicate that 58% of people experienced disgust from these labels. While these labels also evoked fear (44%) the authors acknowledge that the effects of these labels were similar when these emotions were analyzed as individual variables. Specifically, people who experienced disgust or fear were significantly more likely to have read and thought about the warnings included in the packets (health and cessation information were included inside the packet). Also, these individuals were significantly more likely to have quit, made an attempt to quit, or reduced their smoking consumption. In addition, 50% of people wanted more health information and 27% felt there was too much information provided. A potential criticism of the use of disgusting images is that people will be turned off and will avoid the message. However, even when people hid or covered up the images, the effects on cessation behavior were unchanged. There was also no reported reactance from these labels (i.e., increased smoking behavior). This study had several limitations however. First, the study was initiated nine months after the cigarette packets were introduced. This means there were no true pre—post—measures. Second, without a control group or community there is a possibility that other factors (such as changes in social trends) affected these results. Still, Hammond et al.'s (2004) study does provide some evidence that when the dominant emotion evoked is disgust it can influence behavior. Furthermore, in support of Hammond et al.'s (2004) findings, one year after the introduction of these graphic images, cigarette sales in Canada declined by 5.2% (Martens, 2002).

The Canadian case study prompted a more controlled study that examined the use of graphic images with written health warnings on cigarette packets. Kees, Burton,

Andrews, and Kozup (2006) had student smokers look at cigarette packets that had no additional image or one of two graphic images (a diseased lung or a deformed baby). A further manipulation was the inclusion or exclusion of a written health warning (as is currently seen on cigarette packets). Kees et al., (2006) reported that the inclusion of the graphic images resulted in greater intentions to quit smoking compared to the cigarette packets that did not include a graphic image. However, in this study the authors did not measure experienced disgust. Instead, they measured negative affect, a composite variable that included feelings of fear and anxiety, but no measure of disgust. Therefore, while the Kees et al.'s (2006) study supports the findings from Hammond et al., (2004) it does not show that it was disgust that influenced subsequent intentions. The present study attempts to provide a systematic appraisal of the effects of different types of disgust on persuasion, while also comparing these effects to those obtained by inducing fear.

The final section of the literature review examines the cognitive processing of disgust. How emotions influence persuasion and information processing is also discussed. Finally, Nabi's (1999) cognitive—functional model for the effects of discrete emotions on persuasion is also presented. The way that disgust is processed within this framework is discussed.

COGNITIVE PROCESSING

When people think about moral dilemmas the area of their brain that is engaged corresponds to regions involved in emotional experience, rather than on judgment (Greene, Sommerville, Nystrom, Darley, & Cohen, 2001). This demonstrates that moral evaluations are based primarily on emotions, such as disgust, rather than reason. In addition, moral judgments have been reported to be more severe when participants have been hypnotized to feel disgust whenever they read an arbitrary word (Wheatley & Haidt, 2005). It is therefore likely that persuasive health messages may influence emotions and

subsequently judgments that promote behavior change. However, relatively little is known about information processing for disgust—related stimuli (Sawchuk, Lohr, Lee, & Tolin, 1999; Tolin, Sawchuk & Lee, 1999). What is known, however, is that negative affect tends to be subjected to more effortful and detail—oriented cognitive analysis than is positive affect (Schwarz, 1991). In addition, negative and frightening mental images are better remembered than positive images (Leventhal & Tomarken, 1986). This tendency to focus on negative or undesirable stimuli has been coined, "automatic vigilance" (Pratto & John, 1991). Automatic vigilance has been demonstrated to operate even when attention is deliberately focused elsewhere. The mechanism has been suggested to exist because individuals would want to direct attention to unwanted information so that they can attempt to refute it (Wyer & Frey, 1983), or to reconcile this information with previously held attitudes and mental schema (Fiske, Kinder, & Larter, 1983). Furthermore, it has been suggested that focusing on negative social information makes adaptive sense as this information may be more relevant to personal risk (Pratto & John, 1991; Schwarz, 1991). An attention bias towards negative information serves as an early detection system for danger (Charash & McKay, 2002). This is demonstrated by individuals who pay more attention to information that is inconsistent with what they would prefer to hear than to information that is consistent with what they would prefer to hear (Ditto & Lopez 1992; Ditto, Munro, Scepansky, Apanovitch, & Lockhart, 1998). Health information that is preferable (i.e., the person is absent from disease), for example, receives less criticism than health information that is not preferable (i.e., the person has a disease). People who receive such information provide more alternative explanations, believe the health condition is less serious, more common, and that the diagnostic test is less accurate (Ditto & Lopez, 1992).

Specific research on whether disgust improves memory recall has produced conflicting results. Newhagen (1998) reported that news stories that contained disgusting images had lower memory recall than did stories that included anger or fear evoking images. However, participants' memory was determined by whether they could correctly recall images, not actual news content. While participants may have been motivated to look away from the images, it does not necessarily mean that they did not listen to the audio. In fact, in an earlier study Lang and Newhagen (1996) reported that news stories that contained negative images (described as including graphic images of death, maiming, and injury; all of which would be considered to elicit disgust) were better remembered than the same news stories which did not include negative images. Moreover, Newhagen's (1998) description of the disgusting images used in his study (starving famine victims) could also have invoked other emotions such as guilt, shame, or pity. In fact, previous research has used pictures of starving people and reported them as evoking pity instead of disgust despite the fact that reporting the feeling of disgust was an option (Lang, 1995). Moreover, during the construction of news stories, participants in Newhagen's (1998) study were limited to reporting anger, fear or disgust as the emotion invoked. It is quite plausible that disgust was not the dominant emotion invoked in Newhagen's disgust condition.

In contrast to Newhagen's findings Charash and McKay (2002) reported that people who have been primed with mood congruent disgust report greater memory recall of disgust words after having performed a Stroop color naming task. During this task participants are shown words in various colors and are asked to name the colors. The Stroop task is a common tool used to demonstrate the effects of attention biases on selective attention tasks. In addition, Smits, Telch and Randall (2002) observed that disgust tends to have a lingering effect. Participants in their study were exposed to

tarantulas and reported that experienced disgust declines slower than experienced fear. Also, the decline in disgust and fear were partially independent of each other. W. Miller (1997) reveals a possible explanation for this lingering effect when he writes:

> Fear without disgust sends us fleeing to safety and to a sense of relief, but disgust puts us to the burden of cleansing and purifying, a much more intensive and problematic labor than mere flight, one that takes more time and one at which we fear we may not have quite succeeded. Pure fear decays much more rapidly than the slow—decaying, always lingering disgust. (p. 26)

One would suspect that this lingering effect would be beneficial for persuasive messages, in particular remembering these messages. In fact, commercials that include disgusting stimuli have been shown to have enhanced recall of their central concepts (Englis, 1990). In comparison, commercials that elicited fear, happiness, or warmth were not as well remembered. Moreover, recall of a commercial's central concepts immediately afterwards, four days or eight days after having watched the commercial was superior with disgust evoking commercials compared to commercials that evoked fear, happiness, warmth or regret. Englis (1990) suggested that commercials should try to include disgust evoking material to help consumers remember these messages. This might seem a surprising recommendation until one actually reflects on commercials we see on a daily basis. Disgust is often combined with humor or fear to facilitate memory recall. Dial's commercial entitled "Happy Dog" illustrates the merging of disgust with humor. This commercial shows a dog licking his owner's face after drinking from the toilet. The voice over declares, "You're not as clean as you think. Aren't you glad you use Dial?" This commercial demonstrates how the thought of something disgusting (having your

dog lick your face after consuming toilet water) may encourage cognitive processing, memory of the product, and potentially consumer purchasing behavior.

So, while disgust and fear can both be considered negative emotional states and subsequently garner attention, disgust may be longer lasting and appears to be more memorable than other emotions. This may partially be explained by the law of contagion (i.e., once in contact always in contact). While disgust may be interpreted as a negative emotion and subsequently attracts our attention for adaptive purposes there may be another explanation as to why disgust gains our attention and is more memorable. Disgusting images and stories are often interesting and can be alluring.

THE ALLURE OF DISGUST

The fact that disgust can be alluring, even entertaining is not new. In ancient Rome for example, the games featured Christians and criminals being mauled and eaten alive by lions and this served as entertainment (Auguet, 1972). We often see expressions of disgust appear in fine art (such as the paintings of Jenny Saville or the exhibits of Damien Hirst). The horror movie genre often uses disgust to repel and frighten its audience. Also, we prefer to pass on stories, such as urban legends, that are more disgusting (Heath, Bell, & Sternberg, 2001). Moreover, popular television programs also purposely include disgusting material. At one extreme there is the program Fear Factor (which is considered a family program) that has contestants eat disgusting objects and crawl through animal intestines, blood and guts, all in the name of entertainment. In addition, a whole genre of primetime medical and forensic science dramas (such as the CSI series, House, ER, Bones, to name but a few) all include images of dead bodies, body envelope violations or some other form of disgusting stimuli. One would assume that the placement of these programs in primetime, high advertising revenue—generating spots, would indicate that these types of programs (including their disgusting aspects) are

popular. In addition, research by A. Miller (2006) has shown that when participants are in a naturalistic setting, unaware that an experiment is in progress, the television stories they attend to more are those that are disgusting rather than fearful.

Our attraction or curiosity in disgust is not limited to media entertainment. Even in our daily lives we perform behaviors that are considered disgusting, such as blowing our nose, and then examining the outcome. Furthermore, when research participants view unpleasant and pleasant pictures in a free—viewing context the amount of time spent viewing these pictures is equitable (Lang, Greenwald, Bradley, & Hamm, 1993). So if disgust's action tendency, according to Lazerus (1991), is a "very strong impulse to eject the offensive substance or idea" (p. 262) why do people find themselves so tempted by the disgusting?

Perhaps part of the reason is that indulging in the disgusting is akin to being tempted by the forbidden (Jones, 2000). The forbidden, by its very nature of being prohibited, increases its scarcity. Subsequently the demand and the value associated with it increases, at least for some people. Action and horror movies often include gruesome scenes as this is supposed to attract viewers rather than repel them. While W. Miller (1997) suggests there is some satisfaction, even pleasure, obtained by overcoming what disgusts us, he also recognizes that the "double—take reflex" is also born out of a fascination of disbelief. S. Miller (2004) alternatively suggests the reason we turn away from seeing something disgusting on television is partly because by seeing we create and therefore "to react with disgust at badness means badness is unimaginable and one is good" (p. 123). Thus, acting with disgust serves to affirm our purity or goodness.

The complexity of disgust however does not cease here. While earlier it was acknowledged that disgust can be demeaning, it can also be a source of pride (W. Miller, 1997), particularly if we overcome our disgust response. The ability to watch a horror

movie, for example, may be considered an act of bravery, particularly with younger people. From a more humanitarian perspective, people who look after the sick and have to perform disgusting behaviors such as cleaning up feces, vomit or dressing pus inflicted wounds are admired rather than despised. The problem with disgust is that while it allows us to feel superior to the disgusting contaminate, simultaneously we are aware of our own vulnerability to being defiled by this contaminate (W. Miller, 1997). Those who can overcome the contaminant can, in some circumstance, be held in high regard and respected. Therefore, disgust is not always a repellant, and can often be an attractant. Disgust can be a novelty, and in some cases its relative scarcity increases the value of stimuli that elicits disgust. However, disgust does not have to be scarce; it can also be a means of reaffirming our own goodness. Thus one experiences and acts with disgust to common everyday events, such as flatulence, as a means to elevate (or preserve) one's social or spiritual standing.

The previous sections have illustrated the complexity of disgust. Disgust, which can be both repellent and attractant, is difficult to ignore, is well remembered, and in part defines morality. To be persuasive, a message must attract the reader's attention. While the actual image may not be remembered, the gestalt of the message must be retained for a message to be persuasive. Disgust has the ability to elicit these outcomes, thus it seems a suitable emotion to use in persuasive messages. The manner by which persuasive messages are processed provides insight into the potential value of disgust elicitation in persuasion. The next section examines the potential effects of emotions, particularly disgust, on information processing.

EMOTIONS AND PERSUASION

Dual process models of information processing, such as Petty and Cacioppo's (1986) Elaboration Likelihood Model (ELM) are often used in persuasion research. This

theory states that message processing can occur via two routes. Message processing is considered to exist on a continuum with one end involving systematic or central processing where high levels of elaboration are required. With central processing, messages are carefully scrutinized and evaluated based on the strength and validity of arguments presented. In contrast, the other end of the continuum involves using peripheral information, which requires low levels of elaboration. With peripheral processing heuristics, which may or may not be relevant, are often used to decide whether a message should be accepted. Persuasion can occur by either central or peripheral processing, although attitude change via central processing is considered to be more enduring. Variation in the message will influence which type of message processing dominates. The model includes two general factors which in part determine the level of message elaboration. The first requires an individual to be motivated to process the message. For example, messages that are important or more personally relevant are more likely to motivate processing. The second factor requires that the message recipient has the ability to engage in message elaboration. In this instance, ability can refer to having time to attend to the message, or the absence of distractions.

Although the model explains why message factors will influence the way a message is processed, it has been criticized on several grounds. Foremost, the model does not explain how to design a highly persuasive message (O'Keefe, 2002). In particular, the definition provided for a strong argument is essentially one that is persuasive. Subsequently, the model recommends that to design a persuasive message, one should use a message that is successful in persuading. This recommendation has little utility. Further, like many cognitive models, the ELM does not anticipate the effects of emotion. The fact that emotion has been considered as an afterthought in cognitive theories and the ELM is not surprising. Cognitive theories have often considered

emotion as a distraction from or obstacle to "normal" thinking (Forgas, 1995). However, cold or rational thinking that is totally free from emotion is not a frequent occurrence. Instead emotions are often involved in everyday decision making and social judgments (Bower, 1991; Clore & Parrot, 1991).

The ELM does offer post hoc explanations of the ways that affect (where affect represents both mood and emotion) influences elaboration level. One explanation is that affect can serve as an argument (i.e., as information) during high elaboration or as a peripheral cue during low elaboration. Affect is also suggested to influence the extent of information—processing activity (Petty, Cacioppo, Sedikides, & Strathman, 1988). The way that emotions, such as disgust, determine information—processing style may be important for how persuasive messages are developed. For instance, if central processing is the dominant processing strategy when disgust is evoked, then the inclusion of sound arguments would warrant attention. Therefore, along with disgust evoking stimuli, one would want to carefully review factual information contained with the message to ensure that it will sustain scrutiny. If peripheral processing is the dominant processing strategy then the message will likely be designed differently. In this case the inclusion of heuristics would be more suitable for message construction.

Nabi's (1999) cognitive—functional model attempts to account for the effect of discrete negative emotions on persuasion. She suggests that emotions should be able to determine information—processing style. Nabi's model extends the ELM (Petty & Cacioppo, 1986) and incorporates functional emotion theories (e.g., Lazerus, 1991) which argue that behaviors resulting from emotions serve an adaptive response developed through evolutionary processes. In addition to serving an adaptive function, emotions are assumed to be personally relevant to the situation, and to have distinct action tendencies that organize and motivate behavior (Frijda, 1986; Ortony et al., 1988; Lazerus, 1991).

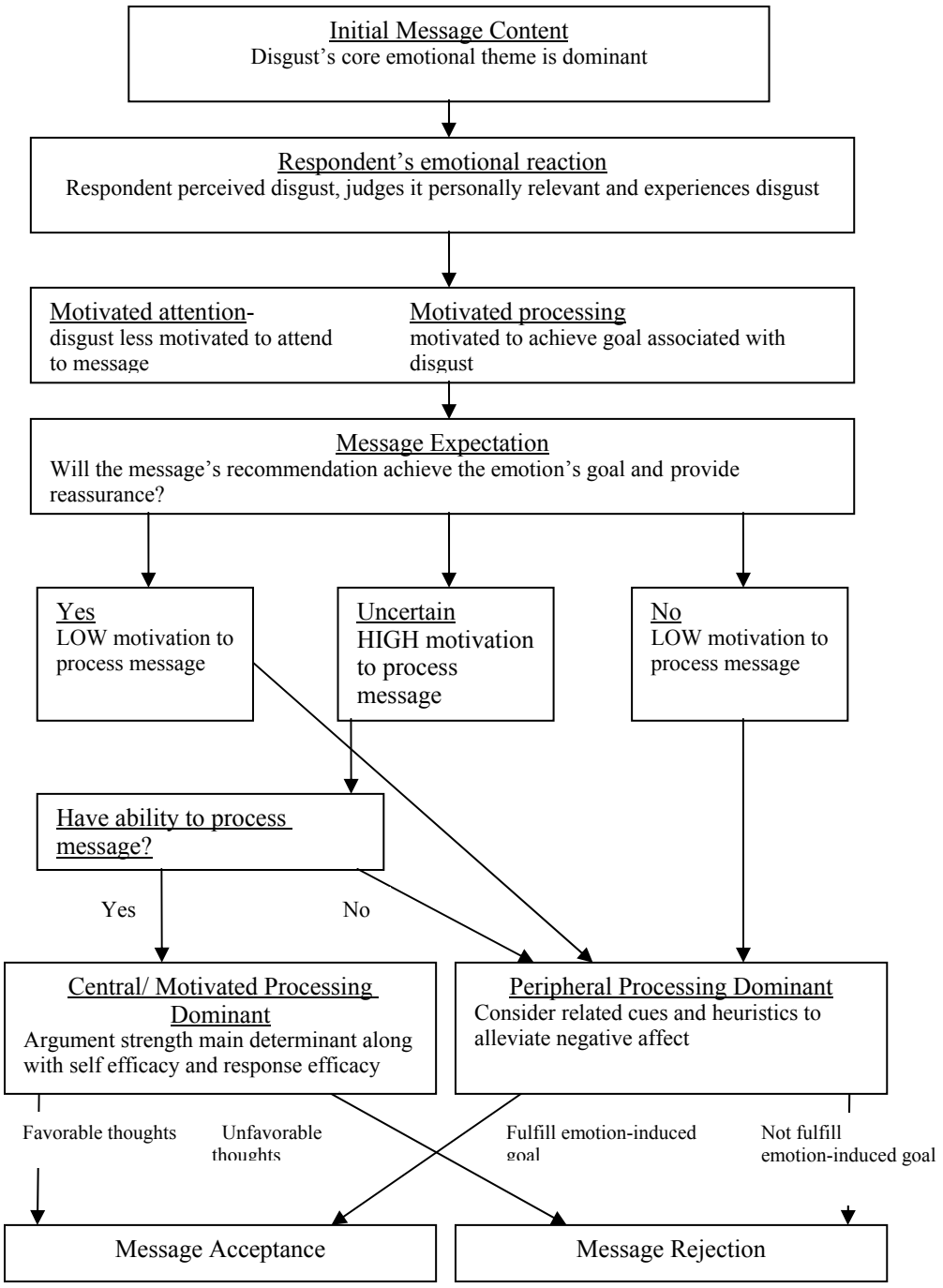
Thus, emotions are subject to appraisal. With this conceptualization, emotions serve as information.

Nabi's model (see Figure 2.1.) attempts to explain the way that specific negative emotions (fear, guilt, anger, sadness, and disgust) influence information processing.

First, the theme, or cause, of the emotion must be present in the initial message. For example, with disgust, the message must contain some aspect which would be considered noxious. This could include images of body envelope violations or words that are associated with disgust (e.g., "fatty", "slimy", etc). The mere presence of disgust does not necessitate that the message recipient experiences this emotion. Therefore, not only does there have to be some aspect of disgust present (such as a diseased limb), but also this aspect must elicit the emotion of disgust. In addition, Nabi (1999) contends that the emotion and message must be personally relevant to the recipient. In the case of disgust, a desire to disassociate oneself with the noxious idea (e.g., not having internal organs covered in fat) would be required to experience the emotion.

Once an emotion is experienced, then, similar to the ELM, the motivation to attend to and process the message is determined. These two motives are suggested to occur simultaneously. The model suggests that the action associated with the emotion determines motivation to attend to and process a message response. The action that is suggested to be associated with disgust is avoidance. In general, it is assumed that people want to create distance between themselves and something they consider disgusting. In contrast, the action associated with anger is approach. People tend to want to confront that which angers them.

Figure 2.1: Nabi's (1999) modified Cognitive—Functional Model for the effect of disgust on persuasion



Motivation to process the message is hypothesized to be low if the emotion is associated with avoidance (e.g., disgust). Subsequently individuals who experience disgust will be less motivated to carefully process message information. With an emotion that is associated with approach behavior (e.g., anger), message processing is hypothesized to be high. Therefore, a message that provokes anger would be expected to motivate message processing. The action associated with an emotion creates what Nabi (1999) terms a baseline level of motivation.

Message processing is further influenced by the degree to which individuals expect the remainder of the message to contain reassuring information that will alleviate the negative emotional state. With an emotion associated with avoidance, motivation to process the message will be high only under conditions where the message recipient is unsure whether the message contains reassuring information. In this circumstance, the individual is motivated to process the message because he or she is trying to find some way to perform the action associated with the emotion. So for disgust, the message recipients are looking for a solution that will allow them to avoid the disgusting object or idea. Under high or low expectations, message processing is expected to be low; subsequently, peripheral processing will dominate. With high expectation a ready solution is offered.

In contrast, emotions associated with approach are suggested to motivate processing if the message will satisfy the action associated with the emotion. With anger, for example, if the message contains some form of redress, then it would be expected that the motivation to process the message would be high. In this instance, provided the message recipient has the ability to process the message, central information processing strategies would dominate.

To summarize, Nabi's (1999) model hypothesizes that disgust, under conditions where it is expected that the message will provide a way to avoid the disgusting object/idea, will induce peripheral processing. In contrast, anger is expected to lead to central processing. For peripheral processing, message acceptance is determined by the presence of peripheral cues that fulfill the emotion induced goal (i.e., the action the emotion motivates). With central processing, message acceptance is determined by an appraisal of argument strength (with more favorable thoughts leading to message acceptance).

Until now, the model has been discussed relative to some unitary emotion, disgust. Yet there are different types of disgust. Animal—nature disgust (e.g., body envelope violations, fat, gore), as described earlier, is similar to the lay—person's understanding of disgust as something "gross". It therefore appears that the theoretical understanding of disgust is more closely aligned with animal—nature disgust.

In contrast, moral disgust is associated with offenses which are considered a violation of some moral or ethical code (Rozin, et al., 2000). Furthermore, the core theme or cause of anger is a demeaning offense (Lazerus, 1991). Therefore, moral disgust, which includes an offense, would be assumed to also elicit anger. Nabi (2002) has acknowledged that the lay—person's understanding of disgust has been posited to encompass elements of anger. Furthermore, research has shown that the emotional profile of moral disgust includes significantly higher levels of anger, although disgust is still the dominant emotion experienced (Marzillier & Davey 2004; Simpson, et al., 2006). It would therefore appear that moral disgust, which involves offenses likely to arouse anger, is more closely aligned to the lay—person's understanding of disgust.

To summarize, animal—nature disgust is more closely aligned with the theoretical understanding of disgust. It is this type of disgust that is assumed to be

associated with an avoidance action. Moral disgust is more closely aligned with the lay—person's understanding of disgust. This type of disgust, which encompasses anger, would be expected to motivate an approach action. Based on Nabi's model, it would be expected that these two types of disgust would be processed differently. Animal—nature disgust would be assumed to lead to peripheral processing provided the message includes reassurance. Moral disgust would be assumed to lead to central processing provided the message includes reassurance.

However, Nabi's model assumes that animal—nature disgust motivates avoidance and moral disgust motivates approach. Elicitors of animal—nature disgust (gore, deformity, etc) have also been suggested to be attractive (W. Miller, 1997). If animal—nature disgust does attract attention then we would assume that this would motivate processing. Furthermore, there is evidence that undesirable stimuli, such as animal—nature disgust, is subjected to closer scrutiny (Pratto & John, 1991) and this would imply that central, as opposed to peripheral, processing would dominate. Therefore, under conditions where there are expectations that the message will provide reassurance, and where the individual has the ability to process the message, we should expect messages that elicit animal—nature disgust to be central processed. This is in contrast to the model's assertions.

Nabi's model predicts that an emotion with an approach action tendency, such as moral disgust, would be centrally processed. However, a closer examination of moral disgust suggest otherwise. Moral disgust can shape cultural values and create social norms (Looy, 2004). Moral disgust segregates, creates hierarchies and then maintains these hierarchies. In essence it creates in—groups and out—groups. One way that these boundaries are created is through the use of stigma. A defining characteristic of a stigma is that it includes some mark for categorization into the stigmatize group (Smith & Miller

in press). These marks serve as peripheral cues. In fact, one purpose of stereotypes, such as those used to stigmatized others, is to reduce the amount of cognitive processing to process incoming stimuli. In addition, stigmas would be expected to motivate avoidance as opposed to approach behavior. This is in contrast to Nabi's model where moral disgust should motivate approach behavior. Based on this discussion, under conditions where reassuring information is present, it should be expected that moral disgust would be peripherally processed. This is in contrast to the model's hypothesis. Table 2.1 below summarizes these observations.

Table 2.1: Proposed elaboration of animal—nature and moral disgust

Emotion	Action tendency (based on Nabi's model)	Proposed action tendency	Processing (based on Nabi's model with reassuring message)	Proposed processing with reassuring message
Animal—nature disgust	Avoidance	Approached due to interest/ novelty	Peripheral	Central due to interest/ motivation
Moral disgust	Approach due to anger	Avoidance	Central	Peripheral due to stigma

This discussion has identified two competing hypotheses. Therefore, this study will test Nabi's model to determine whether animal—nature and moral disgust differ in the way that they are cognitively processed, and the nature of any differences.

SUMMARY AND FORMULATION OF HYPOTHESES

This literature review has provided a historical account of research on disgust. Moreover, it has sought to develop a deeper understanding of exactly what disgust

comprises. The way that the meaning of disgust has evolved and the different categories this evolution has created were discussed. Disgust was revealed to be an emotion that influences social norms and one way that it achieves this is through the creation of distinguishable marks that serve to stigmatize others. Disgust has often been used to augment fear by including gruesome and vivid images. Contrary to popular belief, these types of fear messages have been successful in influencing health behavior, particularly when the message has a high perceived response efficacy and self efficacy component. Research on the use of disgust in communications has suggested that disgust is more memorable than other emotions typically used in health promotion. In addition, though disgust is often considered a repellent, it can also be an attractant. Moreover, disgust is a popular social medium- people enjoy watching and talking about things that are disgusting. Furthermore, disgust has been demonstrated to garner subconscious and conscious attention. Research on the way that emotions process a persuasive message has tended to provide only post hoc explanations of their effects. Nabi's (1999) cognitive—functional model has attempted to account for the effects of discrete negative emotions. However, this model does not account for the different forms that disgust can take, nor does it consider the attractive nature of disgust. This study examined whether a persuasive message that elicits disgust can influence physical activity by gaining greater attention, being more memorable, and motivating behavior. In addition, this study examined how animal—nature and moral disgust influence cognitive processing by testing the cognitive—functional model for the effects of discrete negative emotions on persuasion.

Therefore, based on the above discussion the following hypotheses are categorized into hypotheses related to emotional affect, cognitive processing, and behavior related to physical activity.

Hypotheses related to Affect

H1: The inclusion of a disgusting image will enhance the fear experienced from a fear and no fear health message.

H2: Different types of disgust (animal—nature and moral disgust) can be quantitatively differentiated in a health message advocating physical activity.

H3: The combination of disgust and fear will enhance the outcomes related to memory and physical activity.

H4: Disgust and fear will not differ on outcomes related to memory and physical activity.

Hypotheses related to Cognitive Processing

H5: A health message that includes a disgusting image will better capture attention than will a health message that does not include a disgusting image.

H6a: A health message that evokes disgust will enable more information to be retrieved from memory than will a health message that does not evoke disgust.

H6a: A health message that evokes fear will enable more information to be retrieved from memory than will a health message that does not evoke fear.

H7a: A health message that evokes disgust will enable more information to be encoded into memory than will a health message that does not evoke disgust.

H7b: A health message that evokes fear will enable more information to be encoded into memory than will a health message that does not evoke fear.

H8a: A health message that evokes animal—nature disgust will be centrally processed.

H8b: A health message that evokes moral disgust will be peripherally processed.

Hypotheses related to Physical Activity

H9: A health message that evokes disgust or fear will result in more physical activity behavior (moderate and vigorous) than will a health message that does not evoke disgust or fear.

H10: A health message that evokes disgust or fear will result in more information seeking behavior than will a health message that does not evoke disgust or fear.

H11: A health message that evokes disgust or fear will result in more fitness test redemptions than will a health message that does not evoke disgust or fear.

H12: A health message that evokes disgust or fear will result in more social diffusion of the health message than will a health message that does not evoke disgust or fear.

Chapter Three: Pilot Studies

Several pilot studies were conducted prior to the main study to develop the experimental materials. Specifically, the pilot studies were designed to select materials and calibrate measurement items and scales. Pilot Study One and Two investigated whether animal—nature and moral disgust could be quantitatively differentiated. Pilot Study Three was performed to select appropriate images to be used in the main study and to ensure that the inclusion of a caption to these images did not affect the emotional reaction they produced. Finally, Pilot Study Four developed and tested text material to accompany the images selected. Each pilot study is presented and discussed below.

PILOT STUDY ONE

Pilot Study One had two purposes. First, the study calibrated measurement items used to measure participants' emotional reaction to disgusting images. Multiple items were used to measure disgust, fear, and anger. Second, the study sought to investigate ways of differentiating participants' emotional reaction to animal—nature and morally disgusting images. The rationale for investigating participants' emotional reaction to animal—nature and morally disgusting images was to determine whether participants could experience different emotions when viewing two different types of disgust evoking images. This was important because in order to test Nabi's (1999) cognitive—functional model and the way in which different types of disgust are cognitively processed, it was essential that participants could differentiate between disgust evoking images, and that these distinctions could be reliably measured. That is, it needed to be confirmed that when viewing morally disgusting images, participants felt moral disgust, and when viewing animal—nature disgusting images, participants felt animal—nature disgust.

Eighteen images were selected to be tested (see Appendix A). Images were selected using various internet search sites and web sites (google.com, yahoo.com, gettyimages.com). Key words, such as "disgust", "disgusting", and "gross" were used to search for images. Although the actual number of images viewed for consideration for inclusion into the study was not recorded, it was estimated that several hundred images were viewed. From this pool approximately 70 images were discussed as potential test pictures. The criterion used to select images for inclusion into Pilot Study One was based on the images matching specific categories of disgust. For example, for the category of body—envelope violations, images needed to include internal organs, open wounds, or some similar image. For the category of moral disgust, images were chosen based on potential stigmas that may be associated with these images. Images of people appearing lazy or engaging in a gluttonous behavior were chosen. Gluttony has previously been used as a potential elicitor of moral disgust (Marzillier & Davey, 2004). In addition, images were selected based on the researcher's affective response produced from viewing these images (i.e., the images were successful in making the researcher feel disgust).

To reduce the number of images for the study, two researchers discussed each image and the magnitude of disgust that the image elicited. From this discussion the final eighteen images were selected. The eighteen images consisted of body envelope violations, moral disgust, and two control pictures. The two control pictures included a neutral picture and one designed to evoke universal disgust. A universal disgust image is one that is hypothesized to evoke disgust in all people regardless of context. Typically feces are considered the universal disgust image although vomit (which was used in this study) has also been suggested as another universal disgust elicitor (Rozin, Hadit, & McCauley, 1999).

It was hypothesized that animal—nature disgust pictures would produce greater feelings of being "grossed out" than would moral disgust pictures. The rationale for this hypothesis was based on Nabi's (2002) findings that the layperson's interpretation of the word disgust more closely resembles "grossed out" and animal—nature disgust. In addition, moral disgust pictures were hypothesized to produce greater feelings of anger than animal—nature disgust pictures. Finally, because "disgust" is often considered by laypeople to mean moral disgust (Nabi, 2002), it was expected that moral disgust pictures would produce higher ratings for "disgust" that animal—nature disgust. Thus, it was anticipated that animal—nature disgust and moral disgust would be able to be differentiated using the emotional profiles produced from grossed out, disgust, and anger. Table 3.1 provides a summary of these hypotheses.

Table 3.1: Pilot Study One hypotheses

	Emotional affect		
Picture	Grossed Out	Disgust	Anger
Animal—nature Disgust (AND)	Greater than MD	Lower than MD	Lower than MD
Moral Disgust (MD)	Lower than AND	Greater than AND	Greater than AND

Participants

Thirty—two participants were recruited using an office intercept method at administrative offices of a large Southwestern University. There were 24 females (75%) and 8 male (25%) participants. Participant age ranged from 21 to 68 years old with a mean age of 36.7 (SD= 13.34). The ethnic background of the participants was classified

as 78.1% white, 18.8% Hispanic, and 3.1% African—American. The education level of the participants was 12.5% High School, 3.1% Junior College, 12.5% Currently enrolled at University, 43.8% Bachelors degree, and 28.1% Graduate degree.

Procedure

Participants were informed that they were participating in an "image study". The images were presented in a folder with one image per page. To prevent an ordering effect, the order of the images was changed after each participant completed the study. After viewing each image, participants completed a self—report questionnaire indicating how each image made them feel (see Appendix B). Three emotions (disgust, anger, and fear) were measured using multiple items for each emotion. Disgust was measured with the items "disgusted", "grossed out", and "revolted." The items were averaged to create an aggregate score for disgust. For the anger measure, the items "angry", "furious", and "irate" were averaged. Fear was measured via the items "fearful", "scared", and "frightened," which were averaged to provide an aggregate measure of fear. All items were measured using an 8—point semantic differential scale anchored by "not at all" (1) and "extremely" (8). The dimensionality and internal consistency for these three measures (disgust, anger, and fear) was examined. In addition, these measures were analyzed to determine whether the emotional reaction produced from viewing images could enable animal—nature and morally disgusting images to be quantitatively differentiated. These emotions were drawn from the literature and chosen based on the relationship with animal—nature disgust, moral disgust, and fear.

Results

As each picture was different it was necessary to perform the analysis picture by picture. In addition, because of the subjective nature of this study it was not considered

appropriate to group pictures based on the hypothesized type of disgust they would elicit. In effect, it was considered that if the pictures could be differentiated into different types of disgust, then the subsequent analysis would make this visible.

Internal Consistency of Multi—item Scales

For the disgust measures (disgusted, grossed out, revolted) Cronbach alpha's ranged from 0.82 to 0.97 (mean 0.89, SD=0.05). With the fear measures (fearful, scared, frightened) Cronbach alpha's ranged from 0.75 to 0.98 (mean 0.91, SD=0.07). Finally, the anger measures (angry, furious, irate) had Cronbach alpha's ranging from 0.79 to 0.99 (mean 0.91, SD=0.07). The outcomes from this analysis support the use of these multi—item scales to measure disgust, fear, and anger.

Differentiating animal—nature and moral disgust

Six of the pictures were removed from the analysis because they produced very little emotional reactions. The remaining 12 pictures were analyzed to determine if animal—nature and moral disgust could be differentiated.

A 12 (pictures) x 3 (emotion) repeated measures ANOVA was performed. The analysis violated the test for sphericity and therefore Wilkes Lambda was used in the analysis. Subsequently, there was a significant interaction between emotion and picture ($F(10,22)=5.357$, $p=0.005$). Pairwise comparisons of emotions within images were then conducted with a Bonferroni adjustment.

However, this analysis did not produce consistent findings. That is, hypothesized moral disgust pictures did not consistently produce greater anger or greater disgust than did animal—nature disgusting pictures. Similarly, animal—nature disgusting pictures did not consistently produce greater feelings of being grossed out than did morally disgusting pictures.

Discussion

Previous research has shown that disgust can be differentiated by different types of emotional reactions. Marzillier and Davey (2004) used cluster analysis to show that disgust could be separated into "primary" and "complex" disgust. The authors' description of primary and complex disgust mirrors animal—nature and moral disgust, respectively. However, in Marzillier and Davey's (2004) study, participants were asked to imagine specific situations as vividly as possible rather than look at pictures. Written instructions would provide greater control over the interpretation of stimuli. For instance, participants would be asked to imagine eating cooked human meat. In contrast, in Pilot Study One participants would see a picture of an overweight person watching television surrounded by snacks. Informal conversations with participants after the experiment revealed that sometimes people's interpretation of this picture was that the overweight person was relaxing or sleeping, rather than engaging in lazy or gluttonous behavior.

It should also be noted that Marzillier and Davey's (2004) study found conflicting results for the type of disgust experienced when imagining gluttonous behavior. In their first study, gluttonous behavior clustered in complex, or moral, disgust. However, in a follow up study they found that women experienced primary disgust when imagining gluttonous behavior, whereas men experienced complex disgust.

In a more recent study (published after this study was completed) Simpson, Carter, Anthony, and Overton (2006) investigated the type and magnitude of emotions evoked in different disgusting pictures. The authors were able to show a difference between moral disgust and animal—nature disgust, particularly in terms of the amount of anger and sadness experienced. However, these pictures were accompanied with a written description explaining the context of the picture. In the present study no context was provided for the pictures, leaving participants to deduce their own interpretations. In

addition, there was not a moral disgusting image related to lack of physical activity (such as obesity, or gluttony) used in Simpson et al.'s, (2006) study. Instead, pictures depicting racial violence, and sexual infidelity were used. These types of images are perhaps more polarizing than an image depicting obesity.

Based on the results, it does not appear possible to reliably and consistently differentiate animal—nature disgust and moral disgust, at least in the context of physical inactivity, using the terminology and measurements used in this pilot study. Therefore, it was decided to conduct a second pilot study to determine if other terminology existed that could be used to differentiate these two constructs.

PILOT STUDY TWO

Due to the results from Pilot Study One, the second pilot study investigated if different terminology was available to differentiate animal—nature and moral disgust. Images of obese individuals were chosen to evoke moral disgust. Historically obesity has been viewed as a moral failing in both European and Asian cultures (Stunkard, LaFleur, & Wadden, 1998). In addition, disgust researcher Dr. Jon Haidt (personal communication, April 22, 2006) thought that obesity may evoke a moral element from a perceived lack of self control or gluttony. However, he was unsure how a picture of obesity would successfully communicate moral disgust. Considering the theme of this study (i.e., promoting physical activity) images of obesity seemed to be the most appropriate medium to convey moral disgust.

Pilot Study Two examined only moral disgust. Animal—nature disgust was not examined because the terminology used to describe these feelings is well understood. Instead, this pilot study sought to determine whether consistent terminology would emerge when people described their thoughts and feelings from viewing a morally disgusting image in the form of an obese individual.

Participants

A convenience sample of 32 undergraduate students was recruited from a large Southwestern university. Classification variables were not obtained for this pilot study.

Procedure

Participants were shown four different images of obese individuals (1 male, 1 female, and 2 that could be interpreted as being either male or female). These images can be viewed in Appendix C. Immediately after viewing each image participants were given 2 minutes to write any thoughts or feelings that they had while looking at the image. Two coders analyzed participants' responses and identified common themes and threads.

Results

The qualitative analysis of participants' thoughts and feelings did not produce an obvious way to distinguish between animal—nature and moral disgust. The terminology that is commonly used to describe animal—nature disgust (i.e., gross and disgusting) was also used to describe feelings evoked by the images of obese individuals. In addition, a general revulsion theme and desire not to become similarly obese as depicted in the images was discerned. Thus, at least in this study, the terminology used to describe animal—nature and moral disgust seems to be synonymous. Moreover, images produced myriad interpretations. For instance, a picture of a sweaty obese person struggling to carry groceries up a step produced reactions of disgust by some and admiration by others.

It therefore appeared that using images of obese people to evoke moral disgust could not a) successfully produce terminology that would distinguish it from animal—nature disgust (i.e., participants use similar vernacular to describe both emotional feelings) and b) successfully produce consistent emotional reactions for each image (i.e., images evoked different emotions in different people). Furthermore, Haidt (personal

communication, April 22, 2006) felt that obesity would elicit animal—nature disgust as well as moral disgust primarily because obesity would be considered a violation of the ideal envelope (or image) of the body. This observation is supported by Marzillier and Davey's (2004) findings that gluttony was found to elicit both complex (or moral) disgust, and primary (or animal—nature) disgust. Furthermore, the difficulty in separating these two emotional constructs has previously been reported by Rozin, Lowery, and Ebert (1994). Their research showed that in, terms of facial expressions, there are minimal differences between moral disgust and animal—nature disgust.

Because there does not appear to be a reliable way to measure differences in animal—nature and moral disgust, whether using self—report, physiological, or observational measures, the remainder of this study focuses only on animal—nature disgust. Furthermore, by not being able to differentiate between these two types of disgust it was no longer possible to fully test Nabi's (1999) cognitive—functional model or Hypothesis 8. Therefore, Hypothesis 8 was simplified to challenge the predictions of Nabi's (1999) cognitive—functional model that disgust would cause avoidance and subsequently peripheral processing. Thus Hypothesis 8 was changed to:

H8: A health message that evokes animal—nature disgust will be centrally processed.

PILOT STUDY THREE

The purpose of Pilot Study Three was to refine the experimental treatments. In the main study, participants were required to read a brochure that included either a disgusting or a neutral image. However, in order to effectively convey disgust an image sometimes needs to be presented within a certain context. For example, a baby's diaper is not in and of itself disgusting unless there is some context explaining the condition (i.e., soiled) or inappropriate situation (i.e., wearing the diaper on one's head) that makes

the diaper disgusting. Images that were considered for inclusion in the study may have been unfamiliar to the viewer. In particular, images of the interior of the body may not have been recognizable or understood by the viewer. Subsequently, viewers may not have understood the relevance of the image embedded in the brochure or the fact that the image related to physical inactivity. For example, during Pilot Study One it was not uncommon for images of clogged arteries to be mistaken for artwork. Therefore, it was decided to include a short caption to provide some context for the image. There was concern that the use of a caption could make the image evoke primarily fear rather than disgust. Therefore, the image and caption were examined to ensure that disgust was the predominant emotion evoked. Images were selected to be used in the main study based on the results from Pilot Study Three.

Participants

A convenience sample of 141 students was recruited from a large Southwestern university. There were 62 female (44%) and 79 male (56%) participants. The participants were recruited from four undergraduate and two graduate classes. In total, there were 64 undergraduate (45.4%) and 77 graduate students (54.6%).

Procedure

Six different disgusting images were used in this study (see Appendix D). Each image included the caption, "Regular exercise can prevent…" followed by a statement appropriate for the picture. For instance, a picture of a clogged artery had the caption, "Regular exercise can prevent clogged arteries". Participants viewed each image and then completed a short questionnaire indicating how each image made them feel. To prevent an ordering effect, the order of the images was changed for each class.

Disgust and fear were each measured using three items (Appendix E). For disgust these consisted of "disgusted", "grossed out", and "revolted". For fear the items used were "fearful", "scared", and "frightened". Each item was measured using a 5—point semantic differential scale anchored with "not at all" (1) to "very strongly" (5). The three—item scales were averaged to form aggregate scores of disgust and fear.

Results

Pilot Study Three was conducted in parallel with Pilot Study Two. At that time both animal—nature and moral disgust were still being considered. Therefore, Pilot Study Three included three images designed to evoke animal—nature disgust and three images designed to evoke moral disgust. The results for all six images are described. However, only the images depicting animal—nature disgust were considered for use in the final experimental treatments.

The internal consistencies of the two 3—item scales again were highly reliable. Because each picture was different it was necessary to determine the internal consistencies for each individual picture. For the fear measures Cronbach alpha's ranged from 0.86 to 0.94 (mean 0.90, SD=0.03). For the disgust measures Cronbach alpha's ranged from 0.80 to 0.92 (mean 0.88, SD=0.04).

A one sample *t*—test was performed on the disgust and fear measures and tested to be different from a value of 2 (α=0.95%) using the 5—point semantic differential scale mentioned previously. The value of 2 was chosen to represent a moderately high level of emotion evoked. Results indicated that five of six pictures and captions evoked a disgust rating significantly greater than two ($p<0.05$). In contrast, only two of the six pictures and captions evoked a fear rating significantly greater than two ($p<0.05$). This analysis was repeated with a test value of 2.5 to provide a more stringent test. When this analysis was expanded to examine values greater than 2.5, four of the six pictures and captions

still evoked significantly greater disgust ($p<0.05$), whereas none of the six pictures and captions evoked significantly greater fear.

Based on these results, the inclusion of a caption does not affect an image's ability to evoke disgust. The captioned images were still able to evoke disgust. Moreover, the dominant emotion evoked in these images is disgust, rather than fear. Thus, all three images meet the criteria for inclusion in the brochures. The means and standard deviations for each of the animal—nature disgust evoking images, along with the amount of emotion each evoked are presented in Table 3.2.

Table 3.2: Disgust and fear evoked by each image

	Disgust		Fear	
Image	Mean	SD	Mean	SD
Diabetic Foot	4.07	0.96	2.64	1.32
Exposed Guts	3.32	1.19	1.94	1.13
Clogged Artery	2.93	1.20	2.22	1.18

Based on these results, the image of the exposed guts and clogged artery were chosen to be used in the main study. The diabetic foot was not selected for several reasons. First, although it did produce the highest level of disgust, it also produced a moderate amount of fear. It was decided that having an image that produced moderate amounts of fear could confound the results. Furthermore, a potential criticism of using these types of images is that they are too graphic to be used in a communication designed for a mass audience. It was therefore decided that the diabetic foot would not be an

appropriate image to use in this study because, realistically, it is questionable whether it would ever be used in a mass communication.

PILOT STUDY FOUR

The fear/no fear conditions were evoked via text accompanying the images in a brochure. Two texts were developed; one to induce fear and the other to be neutral. The two messages were equivalent in word count per paragraph, number of arguments presented, format, and spacing. Each message was designed to be inline with recommendations on physical activity from the CDC (CDC, 2006). In addition, wording for the two messages was derived from health brochures from Canada (Health Canada, n.d.) and Australia (Australian Government, 1999). These brochures were used to reduce the probability that the participants had previously read this exact information. The majority (75%) of the wording in each message was identical. The remaining 25 percent of the information differed in that one message was designed to be fearful and the other non fearful. The design of the fearful message was inline with recommendations from Witte, Meyer, and Martell (2001) (Appendix F).

Participants

A convenience sample of 179 students was recruited from a large Southwestern university. There were 94 female (52.5%) and 85 male (47.5%) participants. Students were recruited from undergraduate (62.4%) and graduate (37.4%) degree courses. Each student read one message only; creating two experimental groups. A chi—square analysis revealed that that there were no significant difference between experimental groups based on gender (χ^2 (1) = 0.45, $\underline{p}$=0.50) or degree course (χ^2 (1) = 0.01, $\underline{p}$ =0.92).

Procedure

Participants were randomly assigned to read either the fearful or non fearful message. Each participant was asked to read the message and then complete a short questionnaire. The questionnaire contained the same three item scales used previously to measure evoked fear. In addition, there were a number of filler items to prevent participants from predicting the purpose of the study. Finally, the questionnaire contained the classification variable of gender.

Results

A one—way ANOVA on fear was significant $F(1, 177) = 36.70$, $p<0.001$). Table 3.3 presents the mean scores for each message.

Table 3.3: Mean scores for Experienced Fear

Treatment Manipulation	Mean	Standard Error
No Fear Message	1.32	0.06
Fear Message	2.26	0.14

Based on these results it is concluded that the messages created can be differentiated by the level of fear evoked. Therefore the two messages were used to represent the two treatment effects, Fear and No Fear.

Chapter Four: Method

PARTICIPANT RECRUITMENT

One hundred and fifty—six employees from a large Southwestern university were recruited to participate in this study. An email invitation was sent out to University employees inviting them to participate in a study of "health and emotions". The purpose of the study was deliberately vague to decrease the possibility of obtaining a biased sample. In addition, the email informed potential participants that they would receive a free gift valued at $40 for participating. The actual redemption of the gift was a dependent variable, which will be explained in more detail below.

There were 113 female (72.4%) and 43 male (27.6%) participants. The ethnic background of the participants was classified as 71.8% white, 12.2% Hispanic, 3.2% African—American, 9.6% Asian—American, and 3.2% described as Other. Participant ages ranged from 20 to 70 years, with a mean age of 39.26 years (SD=11.75). Six categories of completed education were recorded and separated the participants into High School (7.7%), Junior College (8.3%), Currently enrolled at University (3.2%), Bachelors degree (51.9%), and Graduate degree (28.8%).

A Kruskal—Wallis analysis of the non—parametric variables was performed and there were no significant differences between treatment groups based on gender (χ^2 (5) = 2.84, p=0.73) or ethnicity (χ^2 (5) = 5.26, p =0.39). A MANOVA was performed on the parametric variables and produced no significant differences among treatment groups based on age or education, F(10, 290) =1.05, p= 0.40. Therefore it was concluded that the treatment groups did not differ based on gender, age, ethnicity, or educational background.

Description and Inclusion/ Exclusion Criteria

To be invited into the study participants needed to be University employees and have an email account. Participants also needed to be able to read English as all printed material, including the email invitation, were only presented in English. There were no other variables or criteria for inclusion or exclusion into the study.

Provision for rights of human subjects

Participants were provided with an informed consent form which was approved by the University of Texas's institutional review board. The form indicated that the study would investigate the use of emotions in health communications and the way that emotions affect cognitive processing. The participants were informed that they were not required to participate, and that if they did participate, they could withdrawn from the study at any time without penalty. Participants were provided the opportunity to ask questions and to clarify that they understood the informed consent form. All participants were required to sign the form and were given a copy for their own records. A copy of the informed consent is in Appendix G.

STUDY DESIGN

A 3 (neutral image, disgust image 1, disgust image 2) x 2 (no fear message, fear message) x 3 (pre—reading, after reading, 16 days post reading) experimental design with repeated measures on the last factor was used in this study. The last factor was used only on selected dependent variables. Two disgust images were used in this study in order that internal validity could be confirmed. This study used a true experimental design with a pre—test, post—test, and control group as defined by Campbell and Stanley (1963). Figure 4.1 summarizes this design.

Figure 4.1 Experimental design summary

R	O1	X (neutral image, non fearful message)	O2	O3
R	O4	X (disgust image 1, non fearful message)	O5	O6
R	O7	X (disgust image 2, non fearful message)	O8	O9
R	010	X (neutral image, fearful message)	O11	O12
R	013	X (disgust image 1, fearful message)	O14	O16
R	O17	X (disgust image 2, fearful message)	O18	O19

Treatment groups

Based on the experimental design there were six treatment groups. Twenty—six people were randomly assigned to each treatment group. Participants were assigned to only one treatment group. In total, 156 people participated in this study. Participants completed a short questionnaire on their physical activity before coming to the laboratory. At the laboratory, participants read either a fear evoking, or non fear evoking brochure advocating physical activity that included one picture (clogged artery, autopsy of an abdomen, or a neutral image). A copy of each brochure is in Appendix H. Participants completed a second questionnaire after reading the brochure, and again 16 days later. A full description of this procedure is presented below.

INSTRUMENTATION

The instrumentation used in this study is presented in four sections. First, the manipulation check for emotional affect is presented along with potential covariate measures. Second, instrumentation used to assess information processing variables is presented. Third, instrumentation used to measure behavioral outcome measures is presented. The internal consistency of multi—items scales concludes the instrumentation

section. A complete list of the instrumentation used in this study and the order it was collected is in Appendix I.

Emotional affect and covariates

Emotional affect

Participants completed a 7—point semantic differential scale, ranging from 1 (*not at all*) to 7 (*very strongly*) to indicate the intensity of the emotions they experienced while reading the brochure. Three items were used to assess disgust (disgusted, grossed out, revolted) and three items were used to assess fear (fearful, scared, frightened). Participants answered the question, "The brochure made me feel_____" followed by each of the six terms above. The six items measuring emotional affect were interspersed with the items measuring relevance (see below).

Relevance

Burnkrant and Unnava (1995)'s self—referencing scale was used to measure the extent to which a participant reading the brochure related the information to some aspect of his or her self. The scale consists of the following five items:

1) The brochure made me think about my own experiences with physical activity,
2) The brochure made me think about what it would be like to more physically active,
3) The brochure reminded me of my own experiences with physical activity,
4) I believe the brochure was written with me in mind, and
5) I believe the brochure related to me personally.

Scale items are assessed on a seven—point Likert—type scale anchored with "Strongly disagree" (1) to "Strongly agree" (7). An alpha of 0.89 has been previous reported for this scale.

Disgust Scale

The Disgust Scale (Haidt, McCauley, & Rozin, 1994) was used to control for individual differences in disgust sensitivity. This is a 32—item scale that measures sensitivity to the first seven disgust domains (food, body products, animals, sex, death, body envelope violations, poor hygiene) and magical contagion. Four items are included for each domain. Each of the domains is represented by two true/ false statements that determine avoidance behavior and affective reactions to potential disgust elicitors. The remaining two items present situations and ask respondents to indicate how disgusting they find each situation (not at all disgusting, slightly disgusting, or very disgusting). In each domain the true/false items are personal—reaction items (scored 0, 1) and the second two items are disgust—rating items (scored 0, 0.5, 1). This produces a score ranging from 0 to 32 with higher scores indicating greater disgust sensitivity.

Several studies have validated the Disgust Scale. Haidt, et al., (1994) reported Cronbach's α coefficients of 0.80, 0.83, 0.85 and 0.87 over four samples. Quigley, Sherman, and Sherman (1997) reported a Cronbach's α coefficient of 0.86 and Druschel and Sherman (1999) reported a Cronbach's α coefficient of 0.87.

Importance of physical activity

Participants were asked, "How important do you think it is to be physically active?" This item was measured using a 7—point Likert type scale anchored with "Extremely unimportant" (1) to "Extremely important" (7).

Demographic data

Each participant indicated his or her age, sex, ethnicity, and education via a self report questionnaire. Ethnicity was classified as White, Hispanic, African—American, Asian-American or other. Education was classified as the highest level of education achieved and was subdivided into: some high school, high school graduate, junior college, currently enrolled at University, Bachelor's degree, Graduate degree.

Cognitive Processing Measures

Cognitive processing measures consisted of measures of attention, memory, and processing style. Attention was measured using one variable (heart rate data). Memory is conceptualized in the Limited Capacity Information—Processing Model of mediated message processing as having varying degrees (Lang, 2000). Specifically, memory is dependent upon how much of the information was encoded, how much was stored, and how retrievable this information is from storage. It is quite common that not all three aspects of memory are measured in a single study. In part, completing one memory measure has the potential to affect future measures, thereby confounding any results.

Two types of memory measures were used in this study: memory retrieval and memory encoding. Memory retrieval consists of a free recall task while memory encoding involves a recognition task. Memory storage involves a cued recall task and was not included in this study. Memory storage was not included in this study since the topic of physical activity may be well known by participants. Consequently, a cued recall task could test memory stored prior to being exposed to the brochure, rather than that stored as a result of the brochure. Individuals' prior knowledge could therefore interfere with the sensitivity of the memory message. The free recalled task was chosen because it does not rely on any cued information that could affect the outcomes. The recognition task was chosen because it is a more sensitive measure of memory and assesses the extent

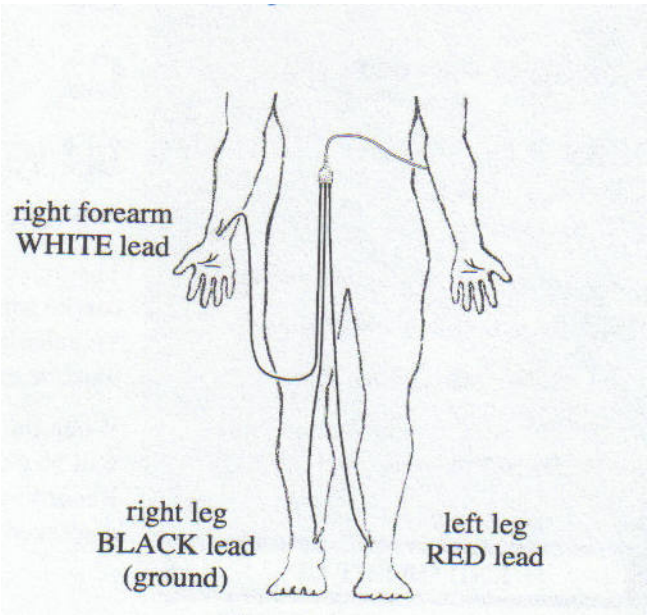
to which a specific piece of information (i.e., the brochure) was encoded (Lang, 2000). These methods of determining message recall have been used in previous research on persuasive messages (Bolls, Lang, & Potter, 2001; Frey & Eagly, 1993; Lang, 1995). Finally, processing style was assessed via a measure of time spent reading and via a thought listing exercise.

Attention

To measure attention, heart rate was measured using an electrocardiogram (ECG). The ECG is a non—invasive way to record heart rate. Research has shown that as the amount of attention paid to a media message increases, heart rate decreases (Lang, 1995). This decrease in heart rate is referred to as an orienting response (OR). Lang (1990) has previously reported two types of OR; a monophasic OR and a biphasic OR. With a monophasic OR, heart rate immediately decreases and peaks around the 6^{th} or 7^{th} beat before recovering to baseline levels by the 10^{th} beat. With a biphasic OR, heart rate initially slows during the first two beats, and then accelerates to a peak by the 7^{th} beat followed by a recovery to baseline levels by the 10^{th} beat.

Participants were connected to a three lead ECG using three surface electrodes attached to their body (1 on each ankle and a third on their right wrist- see Figure 4.2). A Biopac Pro 3.7 was used to collect and record data on a Dell laptop PC. Participants were required to be connected to the ECG while they were reading the brochure. Two minutes of resting baseline heart rate data was collected prior to reading the brochure. Participants were informed when they could start reading. Biopac Pro 3.7 allows markers to be inserted while data is being collected. These markers serve to show when an event, such as being given permission to start reading, has occurred. Upon completion of reading the brochure another marker was inserted. Heart rate was recorded in millivolts and converted to beats per minute every half second.

Figure 4:2 Lead set up for electrocardiogram.



Memory retrieval

Memory retrieval was assessed using a free recall exercise. Participants were given five minutes to write down as many facts that they could remember from the brochure. Participants were informed that "facts" could include recommendations provided by the brochure as well as benefits/risks of physical (in)activity. The number of separate and correctly identified items was counted to produce a quantitative score for memory retrieval. In addition, the number of incorrectly identified items was also counted and recorded. An incorrect item was one that was not in the brochure. This included items which, while factually correct, were not actually in the brochure.

Memory encoding

To measure memory encoding, participants were given a list of 10 statements and asked to identify which, if any, of the statements appeared in the brochure. A copy of this list, along with an answer key for each message (No Fear and Fear) appears in Appendix

J. Participants were given three minutes to complete this exercise. Of the 10 statements, three appeared in both brochures and three appeared in neither brochure. Each brochure included two statements unique to the brochure and three statements which were included in both brochures. Thus respondents were presented with five statements appearing in their brochure and five statements that did not appear in their brochure. Table 4.1 provides a summary of this design.

This manipulation was performed to assess whether there were any differences in memory encoding for common statements (i.e., those present in both No Fear and Fear messages). In effect, this would counter an alternative hypothesis that one message contained language that was more difficult to encode than that used in the other message. The number of correctly identified statements, correctly identified common statements, incorrectly identified statements, and incorrectly identified common statements were recorded to yield four scores for the encoding process of memory.

Table 4.1: Message Encoding design summary

	Brochure	
Statements	Fear	No Fear
Number of Correct statements that appear in BOTH brochures	3	3
Number of Correct statements UNIQUE to each brochure	2	2
Total number of Correct states that appear in the brochure	5	5
Number of Incorrect statements that appear in BOTH brochures	3	3
Number of Incorrect statements UNIQUE to each brochure	2	2
Total number of Incorrect states that appear in the brochure	5	5

Time spent reading

Time spent reading the brochure served as one measure of information processing style. It was assumed that people who take longer to read the brochure are likely scrutinizing the message more fully. This, by definition, is central processing. In contrast, people who take a short time to read the message are more likely to have skimmed through the material. This is more characteristic of peripheral processing.

Participants were instructed to spend the same amount of time they would normally spend reading material of this nature. Participants were informed when to start reading. As soon as they were informed to start reading a marker was inserted into heart rate data being collected via the ECG and Biopac Pro 3.7. Participants were asked to indicate when they had finished so that their heart rate recording could be finished. At this point a second marker was inserted. Time spent reading was then recorded as the time between marker one (start reading) and marker two (finish reading). It was hoped that the ECG helped to mask the fact that participants were being timed. In effect, participants were under the impression (albeit not totally mistakenly) that the main interest of the investigator was the way their heart rate changed while reading. In addition, the Bipac Pro 3.7 provides a very sensitive measure of time within 0.01 milliseconds.

It was assumed that people who were motivated to attend to the message would take more time to read the message. This procedure is often used in persuasion research to determine motivation to process a message (Mitchell, 2000). In addition, by randomly assigning participants to treatment groups, variation in reading level should be similar across groups.

Thought listing exercise

The thought listing exercise served as an additional measure of participants' information processing style. Immediately after viewing the brochure, participants were asked to complete a thought listing exercise. Participants were provided with the following instructions:

> We are now interested in what you were thinking about when you read this brochure. You might have had ideas all favorable to the recommendations in the brochure, all opposed, all irrelevant to the recommendations on the brochure, or a mixture of the three. Any case is fine; simply list what it was that you were thinking while you read the brochure. Try to list each thought or idea on a separate line. Please state your thoughts and ideas as concisely has possible…a phrase is sufficient. IGNORE SPELLING, GRAMMAR, AND PUNCTUATION. You will have 3 minutes to write your thoughts. We have deliberately provided more space than we think most people will need to insure that everyone would have plenty of room to write the ideas they had during the message. So don't worry if you do not fill the page. Just write down whatever your thoughts were during the message. Please be completely honest and list all of the thoughts that you had. Now turn the page and use the space provided to list your thoughts
>
> (adapted from Cacioppo and Petty 1981)

The following page consisted of a blank lined page. Therefore, one page included the instructions, while another page included space for the participants to list their thoughts. Participants' time began when they turned the page to write and ended after three minutes. This procedure is designed to allow participants to access thoughts from short term memory while preventing them from using other mental strategies to generate thoughts (Shapiro, 1994). Participants' thoughts were coded based on their relevancy (relevant/ irrelevant); relevant thoughts were further coded based on their polarity (favorable, unfavorable, neutral). The total number of distinct relevant thoughts generated was used to determine processing style. A greater reliance on central processing was assumed to generate more relevant thoughts. In addition, the polarity measure was used to assess attitudes towards the brochure and to examine evidence of reactance.

Behavioral Outcome Measures

Four behavioral outcome measures were collected. First, participants completed a self—report questionnaire on their physical activity behavior. This questionnaire was completed at three time points; before reading the brochure (and at least one day before arriving at the laboratory), after reading the brochure, and 16 days after reading the brochure. Second, a behavioral observation measure of information seeking was recorded. Third, participants were provided with a coupon for a free fitness test and the redemption of the coupon was recorded. Finally, a measure of social diffusion was collected.

Physical activity questionnaire

A measure of physical activity was obtained at three time points using a self—report questionnaire. The questionnaire informed participants of two types of physical

activity; moderate and vigorous. These types of physical activities were defined using definitions obtained from the CDC (2006). Specifically, moderate activity was defined as activities that cause a small increase in breathing or heart rate. Examples of brisk walking, bicycling, vacuuming, and gardening where provided. Vigorous activity was defined as activities that cause large increases in breathing or heart rate. Examples of running, aerobics, and heavy yard work were provided. The questionnaire asked participants to indicate the frequency and average duration in which they engaged in each of the two types of activities for a minimum of 10 minutes. The product of duration and frequency was used to determine number of minutes per week of moderate physical activity and number of minutes per week of vigorous activity.

Participants were asked to complete the questionnaire before they came to the laboratory to participate in the experiment, after they had finished reading the brochure, and 16 days after they had left the laboratory. Participants were not aware that the third questionnaire was going to be sent to them. Instead, upon completion of all the questionnaires in the laboratory participants were casually asked if the investigator could contact them if he had any further questions. Thus permission was obtained to ask for further information; however, participants were not explicitly informed that a follow up questionnaire was due to be sent.

The wording of the questionnaire was changed to reflect the three time periods. The first questionnaire asked participants to indicate their level of physical activity in a typical week; the second asked them to indicate what they intended to do in the subsequent 7 days; and the third asked them to indicate what they had done in the previous 7 days. The 16 day delay for the third questionnaire was used to get a more reliable indication of future physical activity behavior.

Information seeking

Information seeking was assessed as participant's motivation to find more information on the subject of physical activity. A selection of nine brochures/leaflets was made available to participants. These brochures were obtained from University Health Services, the Recreational Sports Department, and the Fitness Institute of Texas (FIT). Several leaflets contained specific information on how to exercise as well information on gym membership and obtaining the services of a personal trainer. In addition, there were several brochures on nutrition, dieting, and body image.

During the experiment, participants were directed to these brochures and informed in a casual manner that they may take any brochures that interest them. Upon completion of the experiment, participants were again invited to take any brochures with them. While the participant selected brochures the investigator turned his attention away from the participant so that they did not feel that they were being watched. The number of brochures available was counted before and after the participant left so that the number of brochure taken could be determined. The number of brochures taken was considered to be an indication of information seeking.

Fitness test redemption

For participating in the study participants were offered a free gift valued at $40. This gift was a coupon for a fitness test evaluation at the Fitness Institute of Texas (FIT). Moreover, the content of the brochure also urged the reader to have a fitness test. The brochure stated that a fitness test is a great way to know the state of one's fitness level and can motivate one to become more physically active. Each coupon was coded and the redemption of each coupon recorded. The coupon had a short expiration date (15 days) and participants were informed of this. In addition, to prevent the coupon from being transferred to other people, the principal investigator "validated" the coupon by writing

the participant's University electronic identification code (UTEID) on the coupon along with a reference code (indicating which treatment condition the participant was in). The UTEID was not actually recorded and served as a deterrent to transferring the coupon. The coupon included a contact number to book the appointment. Finally, to broaden the appeal of the fitness test, two options were offered. The first consisted mainly of body composition tests, while the second was more concerned with physical strength.

In addition to measuring whether the coupon was redeemed, participants were sent a questionnaire 16 days after having participated in the study. This questionnaire, among other things, asked participants if they tried to contact FIT to book their appointment, whether they actually made a booking, and whether they used their coupon. Furthermore, if they did not use their coupon participants were asked to explain why.

Social diffusion

As part of the follow up questionnaire sent 16 days after the experiment, participants were asked to indicate how many people they talked to about the brochure, the fitness test they were offered, and FIT. It was assumed that as the number of people the participant talked to increased, so too did the degree of social diffusion. Each of these measures was used individually as an indication of social diffusion. These measures were not combined to form an aggregate number because it was not possible to determine whether participants talked to people about all these objects.

Internal consistency

Alpha coefficients were computed for the Disgust Scale, Experienced Disgust measure, Experienced Fear measure, and the Self—referencing Scale. Table 4.2 describes these results.

Table 4.2: Internal consistency of multi—item scales

Scale	Number of items per scale	Cronbach's Alpha
Disgust Scale	32—items	α = 0.846
Experienced Disgust	3—items	α = 0.920
Experienced Fear	3—items	α = 0.899
Self-referencing Scale	5—items	α = 0.653

The alpha scores for the Disgust Scale, Experienced Disgust measure, Experienced Fear measure indicate high levels of internal consistency. The self—referencing scale was considered moderately reliable. Previously research by Burnkrant and Unnava (1995) have reported the self—referencing to be highly reliable (Cronbach's α= 0.89). The dimensionality of the self—referencing scale was checked via principle components analysis and two factors were extracted. These results are presented in Table 4.3. Four items combined to form a single component, while one item formed its own component. Consequently, factor scores for the first principle component were used in all further analyses.

Table 4.3: Factor scores for Self—referencing scale

Item	Component	
	1	2
The brochure made me think about my own experienced with physical activity	0.758	-0.419
The brochure made me think about what it would be like to be more physical activity	0.647	-0.052
I believe the brochure related to me personally	0.726	0.361
The brochure reminded me of my own experiences with physical activity	0.755	-0.335
I believe the brochure was written with me in mind	0.434	0.789

Summary of Instrumentation

Table 4.4 provides a summary of instrumentation used in this study and which variables they represent.

Table 4.4: Summary of instrumentation

Variable	Instrument
Emotional affect and covariates	
Emotional Affect- disgust and fear (manipulation check)	7 point Multi—item self report scale (3 items per emotion)
Relevance (covariate)	Self—referencing scale (5 items)
Disgust sensitivity (covariate)	The Disgust scale (32 items)
Importance of physical activity (covariate)	7 point Likert—type scale (1 item)
Demographics (covariate)	Self report items (age, sex, ethnicity, education)
Cognitive Processing Variables	
Attention (dependent variable)	Heart rate recorded with electrocardiogram
Memory (dependent variables)	
- retrieval memory	- free recall task
- encoding memory	- recognition task (10 statements)
Processing style (dependent variables)	
- time spent reading	- timed using electrocardiogram
- depth of processing	- thought listing exercise
Behavioral Measures	
Physical Activity level (dependent variable)	Self—report questionnaire completed at three time points
Information Seeking (dependent variable)	Number of brochure taken
Fitness test redemption (dependent variable)	Fitness test coupon redeemed within 15 days
Social diffusion (dependent variable)	Number of people informed about a) brochure; b) fitness test; c) FIT

PROCEDURE

University of Texas employees were recruited via email to participate in the study. A copy of the email is in Appendix K. The email informed potential participants

that the study was about “Health and emotions” and promised a free gift valued at $40 for their participation. The purpose of the study was kept deliberately vague to prevent a biased sample. The free gift consisted of the fitness test coupon; its redemption served a dual purpose as a dependent variable. Prospective participants were asked to book an appointment to participant in the study by contacting the principle investigator (PI) via either telephone or email. Once a booking was made, the PI sent the participant the first self—report physical activity questionnaire and instructed the participant to complete the questionnaire and bring it to their appointment.

When the participant arrived he/she was greeted and asked to provide informed consent. The informed consent form stated that, “This study will investigate the use of emotions in health communications and how this affects cognitive processing”. After signing the informed consent form participants were connected to the ECG. The areas that required surface electrodes were wiped with alcohol and allowed to dry. Surface electrodes were placed on the right arm, right ankle, and left ankle (see Figure 4.2). Participants were informed that the ECG records heart rate. In addition, they were asked to remain as still as possible while the ECG recorded data. A lectern was placed in front of the participant and included a single page with one line of text. Participants were asked to seat themselves in a position where they would be comfortable and could read the one line of text without adjusting their sitting position. The one line of text was the same font size used in the brochures; therefore confirmation was sought that the participant would be able to comfortably read the brochure.

Participants were informed that during the recording of the ECG that they should try to remain still as possible as any movement would create a disturbance with the recording. This was important because movement by the participant would result in the

ECG detecting muscular activity thus creating an inaccurate recording of heart rate. Participants were then told:

> In a few minutes I am going to ask you to read a one page brochure. I want you to spend the same amount of time and effort that you would normally spend reading a brochure of this type. Once you have finished reading let me know and I will stop the recording (of heart rate).

The brochure was placed on the lectern and turned away from the participant. After this instruction was given the ECG started to record heart rate. Two minutes of resting baseline heart rate was recorded. It was assumed that the participant would be in a resting state because they had remained seated while completing the informed consent form and receiving instructions. Approximately six to ten minutes elapsed between the time participants sat down and he or she was instructed to start reading. After two minutes, the lectern was turned towards the participant and he or she was instructed to start reading. At this point a marker was inserted into the ECG recording to note the start time. The information provided to participants, its vagueness, and the novelty of the ECG was thought to help mask the fact that participants were being timed. In addition, it was hoped, as per the instructions given, that participants would not read the material more closely than they normally would have. Once the participant finished reading, a second marker was inserted into the ECG reading. There was only one instance when a participant failed to inform the PI that they had finished reading. Subsequently, time spent reading was not recorded for this individual.

As soon as the participant finished reading, the three surface electrodes were removed. Then the participant was presented with the thought listing exercise. After completing this task (three minutes) the participant completed a questionnaire consisting

of the manipulation check (for affect), self—referencing scale, the Disgust scale, and demographic information. In addition, they completed the second physical activity questionnaire which asked participants to indicate their intentions to engage in moderate and vigorous physical activity over the next seven days.

After completing these measures, the participant was casually informed of the different health and physical activity brochures that were available and instructed that when they leave they can help themselves to any that interest them. Completion of the questionnaire and discussion of the brochures served to distract the participant before completing the next set of measures- memory measures.

After viewing the brochures, the participant was then asked to complete the memory retrieval exercise. This exercise required the participant to write down as many facts or recommendations that they could remember from the brochure they had previously read. Participants were given five minutes to complete this task. Following this task was the memory encoding task. Participants were provide with 10 statements and asked to indicate which, if any, of the statements was in the brochure they read. Participants were given three minutes to complete this exercise. After completing this final exercise, participants were given their fitness test coupon and an explanation of what the offer entailed, when the coupon expired (15 days), the location of FIT, shown the number to contact FIT, and had their coupon validated. Finally, the participants were asked whether they could be contacted should the PI have any further questions, were thanked for participating, and were reminded to take any brochures they liked. At this point, the PI turned his attention away from the participants so that participants could browse brochures without being watched. Once the participant left, the number of brochures taken was calculated. This was achieved by having a known number of

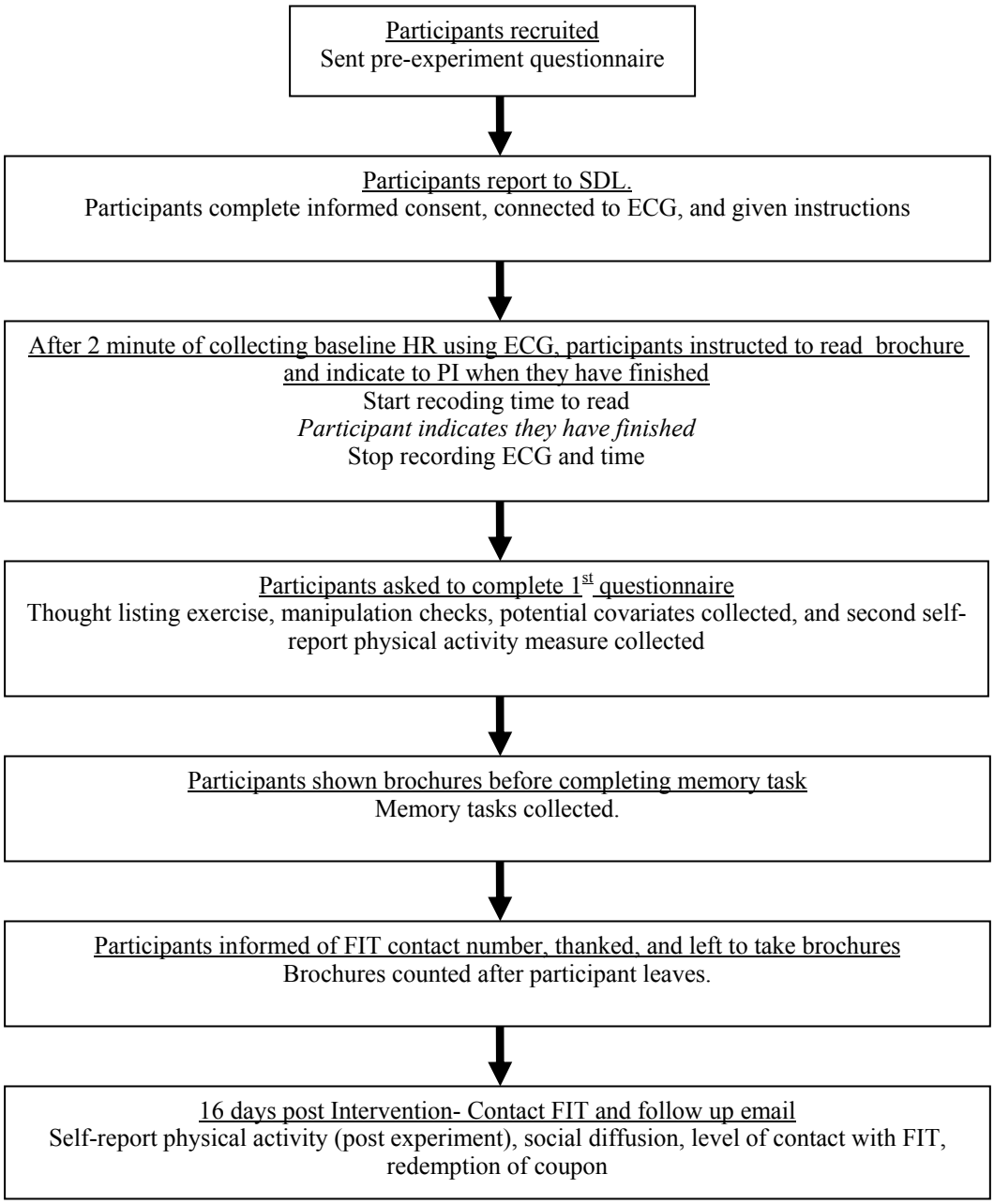
brochures set out before the participant arrived and then counting how many brochures remained once they had left.

Sixteen days after having participated in the study (and a day after their coupon expired) participants were sent a follow up email which included the final self—report physical activity questionnaire, the social diffusion measures, and questions about their coupon use. In addition, if the coupon was not used participants were asked to explain why. An incentive to return the questionnaire was provided via a drawing to receive a gift voucher to a local independent movie theatre. A copy of this email is in Appendix L. Participants were given one week to reply to this email before a reminder email was sent out. Table 4.5 provides a summary of the order of data collection while Figure 4.3 provides a summary of the experimental procedure.

Table 4:5: Order of data collection

Action	Data Collected
Recruitment email sent out	
Participant books appointment	Self—report physical activity (pre—experiment)
	Importance of physical activity measure
Participants' arrive at Sport Development Lab	Complete informed consent
Participant asked to start reading	Heart rate data collected
	Time 1 (T1)
Participant indicates they have finished reading	Time 2 (T2) (time spent reading = T2-T1)
Participants complete questionnaire	Thought listing exercise- 3 mins
	Emotional affect manipulation check
	Self—referencing scale
	Disgust Scale
	Self—report physical activity (intention)
	Demographics
Participant informed of brochures	
Participant handed next series of questionnaires	Memory test- retrieval 5 mins
	Memory test- encoding 3 mins
Participant provided with coupon; directed to brochures; thanked for their time.	Information seeking- number of brochures taken
After 16 days contact FIT	Coupon redeemed
After 16 days follow up email	Social diffusion measures
	Level of contact with FIT
	Self—report physical activity (post experiment)

Figure 4.3: Flowchart of Experimental Procedure



DATA ANALYSIS

The initial data analysis involved an induction check of the disgust and fear manipulation. This consisted of a 3 (neutral image, disgust image 1, disgust image 2) x 2 (no fear message, fear message) MANOVA. Post hoc analysis was performed only on the disgust treatment (as the fear manipulation only consisted of two levels) using Tukey's HSD. The remainder of this section describes the analysis of the cognitive processing variables and behavioral outcomes measures.

Cognitive processing variables

The cognitive processing variables were examined via into two analyses. The dependent variable for attention was assessed individually while the remaining cognitive processing variables were assessed collectively.

Attention was assessed using a multi—step process as recommended by Lang (1990). First, change in heart rate over time was graphed to produce a "cardiac response curve" which shows fluctuations in heart rate. The cardiac response curve was visually inspected to see if an orienting response (OR) occurred. Lang (1990) previously has described two patterns of cardiac response curves that signify an OR, monophasic and biphasic. With a monophasic OR heart rate immediately decreases and peaks around the 6^{th} or 7^{th} beat before recovering to baseline levels by the 10^{th} beat. Thus a monophasic OR resembles the letter 'U'. With a biphasic OR heart rate initially slows during the first two beats, and then accelerates to a peak by the 7^{th} beat followed by a recovery to baseline levels by the 10^{th} beat. A biphasic OR resembles a sideways slanting letter 'S'.

After a visual inspection confirmed the presence of an OR, a trend analysis was performed to determine if there was a significant main effect for time. A trend analysis is a special case of ANOVA that determines whether the bends in a curve are significant. In addition, the trend analysis was used to determine whether there were any differences

among groups. Finally, the trend analysis was analyzed to determine whether the appropriate trend component existed for a monophasic OR (significant quadratic component) or biphasic OR (significant cubic component). Clarifying the presence of a monophasic or biphasic OR would confirm, in line with previous research (Lang, 1990) that attention had occurred.

The remaining cognitive processing variables (memory retrieval, time spent reading, memory encoding, total thoughts) were analyzed using a 3 (neutral image, disgust image 1, disgust image 2) x 2 (no fear message, fear message) MANCOVA. Age, education, disgust sensitivity, importance of physical activity, and relevancy were used as covariates. In addition, follow up analysis was performed on the message encoding variables and the thought listing variable. Specifically, statements common to both brochures were assessed for message encoding using a 3 (neutral image, disgust image 1, disgust image 2) x 2 (no fear message, fear message) MANOVA (message encoding did not have any significant covariates and the presence of covariates was inconsequential). The follow up analysis for the thought listing variable consisted of analyzing the types of thoughts generated via a 3 (neutral image, disgust image 1, disgust image 2) x 2 (no fear message, fear message) MANCOVA.

Behavioral outcome measures

Four separate data analyses where performed for the behavioral outcomes measures. Analysis of the self—report physical activity behavior is described first, followed by the analysis of fitness test participation. Next, analysis of information seeking behavior is explained followed by the analysis of social diffusion data.

A 3 (neutral image, disgust image 1, disgust image 2) x 2 (no fear message, fear message) x 3 (time point) with repeated measures on the last factor MANCOVA was performed on two types of self—report physical activity behavior; moderate and

vigorous. Three time points were used in this analysis; pre—intervention; immediately after intervention and 16 days post intervention. Physical activity scores were calculated as the product of weekly frequency of engaging in physical activity and average duration of each individual bout of physical activity. This analysis sought to determine whether physical activity changed over time and whether there were any differences among groups.

Information seeking behavior was analyzed using a 3 (neutral image, disgust image 1, disgust image 2) x 2 (no fear message, fear message) ANCOVA to determine whether any differences among groups exist. Age, education, importance of physical activity, relevancy, and disgust sensitively were considered to be potential covariates and were included in the analysis.

Three stages of Fitness test participation were analyzed. The stages progressed from contacting FIT, booking an appointment with FIT, and completing a fitness evaluation with FIT. Data for these dependent variables was assessed via a dichotomous variable. Therefore, binary logistic regression was used to determine whether membership in one of the treatment groups predicted the stage the participant reached (contacting FIT, booking with FIT, or completing a fitness evaluation).

Social diffusion was assessed using a 3 (neutral image, disgust image 1, disgust image 2) x 2 (no fear message, fear message) MANCOVA to determine whether groups differed on the amount of people they talked to about the brochure, the fitness test, and FIT. The same covariates (age, education, importance of physical activity, and disgust sensitively) were used in this analysis. Table 4.6 presents a summary of all the variables measured in this study, which hypothesis they address, and what statistical technique was used in the analysis.

Table 4.6: Summary of Hypotheses, Dependent Variables, and Statisitical Techniques

Hypothesis	Dependent Measures	Statistics
H1: The inclusion of a disgusting image will enhance the fear experienced from a fear and no fear health message.	Experienced Fear	3 (image) x 2 (message) MANOVA
H2: Different types of disgust (animal—nature and moral disgust) can be quantitatively differentiated in a health message advocating physical activity.	Emotional Profile	12 (image) x 3 (emotion) repeated measures ANOVA; Content analysis
H3: The combination of disgust and fear will enhance the outcomes related to memory and physical activity.	Number of facts remembered Number of items identified Self report moderate and vigorous physical activity	3 (image) x 2 (message) MANCOVA 3 (image) x 2 (message) MANCOVA 3 (image) x 2 (message) x 3 (time point) repeated measures MANCOVA
H4: Disgust and fear will not differ on outcomes related to memory and physical activity.	Number of facts remembered Number of items identified Self report moderate and vigorous physical activity	3 (image) x 2 (message) MANCOVA 3 (image) x 2 (message) MANCOVA 3 (image) x 2 (message) x 3 (time point) repeated measures MANCOVA
H5: A health message that includes a disgusting image will better capture attention than will a health message that does not include a disgusting image.	Heart Rate	Trend Analysis (repeated measures ANOVA)

H6a: A health message that evokes disgust will enable more information to be retrieved from memory than will a health message that does not evoke disgust. H6a: A health message that evokes fear will enable more information to be retrieved from memory than will a health message that does not evoke fear.	Number of facts remembered Number of facts remembered	3 (image) x 2 (message) MANCOVA 3 (image) x 2 (message) MANCOVA
H7a: A health message that evokes disgust will enable more information to be encoded into memory than will a health message that does not evoke disgust. H7b: A health message that evokes fear will enable more information to be encoded into memory than will a health message that does not evoke fear.	Number of correct/ incorrect items identified	3 (image) x 2 (message) MANCOVA
H8: A health message that evokes animal—nature disgust will be centrally processed.	Number of relevant thoughts generated Time spent reading	3 (image) x 2 (message) MANCOVA
H9: A health message that evokes disgust or fear will result in more physical activity behavior (moderate and vigorous) than will a health message that does not evoke disgust or fear.	Self report moderate and vigorous physical activity	3 (image) x 2 (message) x 3 (time point) repeated measures MANCOVA

H10: A health message that evokes disgust or fear will result in more information seeking behavior than will a health message that does not evoke disgust or fear.	Number of brochure taken	3 (image) x 2 (message) ANCOVA
H11: A health message that evokes disgust or fear will result in more fitness test redemptions than will a health message that does not evoke disgust or fear.	FIT contacted, Fitness test booked, redeemed	Binary logistic regression
H12: A health message that evokes disgust or fear will result in more social diffusion of the health message than will a health message that does not evoke disgust or fear.	Number of people talked to	3 (image) x 2 (message) MANCOVA

Chapter Five: Results

This chapter begins with an induction check on the fear and disgust manipulations. There then follows a short summary on the results pertaining to the effect of combining disgust and fear. The results for Hypothesis 2 (animal—nature and moral disgust can be quantitatively differentiated) is not presented in this chapter as it was previously reported in Chapter Three. The remainder of this chapter is separated into results pertaining to cognitive processing and results pertaining to behavioral outcome measures.

INDUCTION CHECKS OF FEAR AND DISGUST MANIPULATION

A 3 (image) x 2 (message) MANOVA was performed to check to make sure that the disgusting images elicited disgust, and that the fear inducing message elicited fear. It was expected that disgust and fear would interact. They did not ($F(4, 300) = 0.544$, $p=0.703$) and therefore Hypothesis 1 is rejected. Details of the means and standard deviation for the combination of fear and disgust can be viewed in Appendix M.

A main effect was found for both the Fear manipulation ($F(2, 149) = 4.593$, $p=0.012$) and the Disgust manipulation ($F(4, 300) = 8.873$, $p<0.001$). The high fear message resulted in greater experienced fear than did the no fear message. Post hoc analyses using Tukey's HSD was performed on the Disgust manipulation. This revealed that the 2nd Disgust (Guts) image was significantly different from the neutral ($p<0.001$) and the 1st Disgust (artery) image ($p =0.001$). In addition the 1st Disgust image was significantly different from the neutral image at $p =0.10$ level of confidence ($p =0.078$). The mean scores and standard error for each of these conditions are reported in Table 5.1. Based on these results, all further analyses will treat the fear manipulation as having two

levels (No Fear and Fear) and the disgust manipulation as having three levels (Neutral, Artery, and Guts).

Table 5.1: Mean scores for Experienced Fear and Disgust

Treatment Manipulation	Mean	Standard Error
	Experienced Fear	
No Fear Message	1.71	0.11
Fear Message	2.32	0.17
	Experienced Disgust	
Neutral image	1.28	0.11
Disgust Image 1 (Artery)	1.83	0.17
Disgust Image 2 (Guts)	2.76	0.24

COMBINING DISGUST AND FEAR

Hypothesis 3 predicted that the combination of disgusting images with fear messages would enhance results related to memory and physical activity. A 3 (image) x 2 (message) MANCOVA was performed to determine whether the combination of disgust and fear enhanced memory. Disgust and Fear did not interact ($F(12, 272) = 1.26$, $p=0.245$). In addition, a 3 (image) x 2 (message) x 3 (time) repeated measures MANCOVA was performed to determine whether the combination of disgust and fear increased moderate and vigorous exercise. Disgust and Fear did not interact with regards to moderate activity ($F(4\ 254) = 1.28$, $p=0.280$) or vigorous activity ($F(4, 254) = 0.80$, $p=0.529$) (full details can be found in Appendix M). The results indicate that disgust and fear do not interact to enhance results related to memory or physical activity. Hypothesis 3 is therefore rejected. Furthermore, Hypothesis 3 predicted that disgust and fear would not differ on outcomes related to memory and physical activity. This was not the case

and the individual results for disgust and fear are presented below. Therefore, Hypothesis 4 is also rejected.

COGNITIVE PROCESSING

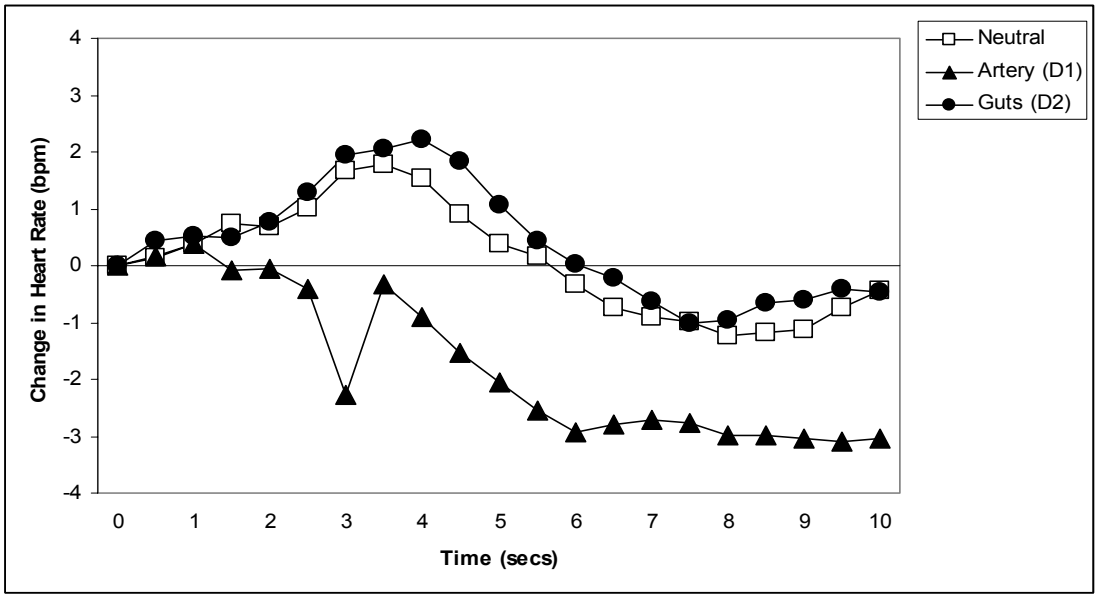
The following section will report results for dependent variables related to cognitive processing. Attention is reported first. The remaining cognitive processing variables (memory and processing style variables) are then analyzed using a 3 (image) x 2 (message) MANCOVA.

Attention

As mentioned previously, attention was defined as the presence of an orienting response (OR). Changes in heart rate were used to determine the presence of an OR. Each participant had their heart rate recorded and calculated every half second while reading the brochure. Participants were asked to remain as still as possible while they read the one page brochure. However, despite these instructions there were cases where participants fidgeted or adjusted their seating position. Any movement by the participant would affect the recording of heart rate because the ECG leads would either also move creating a disturbance or detect electrical activity generated by muscular activity. These events cause extreme and sudden fluctuations in heart rate. A visual inspection of the data determined that there were cases where this did occur. Subsequently a close inspection of the data was performed. Any data set which included massive fluctuations in heart rate were removed from the analysis. Fluctuations greater than 20 beats per minute within a one second span were removed. In total, 16 data sets were removed. It should be noted that half of these data sets included fluctuations greater than 50 beats per minute and another 5 data sets included fluctuations greater than 40 beats per minute. In total four data sets were removed from the Neutral image group, five from the Guts

image group and six from the Artery image group. The cardiac response curves of the three treatment conditions are shown in Figure 5.1.

Figure 5.1: Cardiac response curves for each image

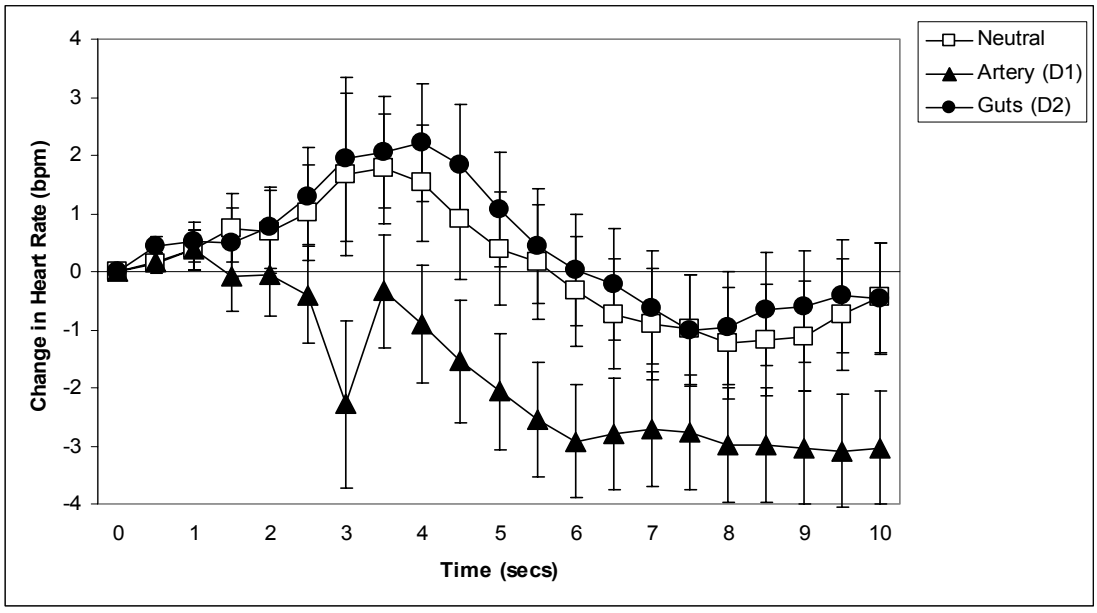


Visual inspection of the cardiac response curves suggests that an OR occurred for each image. The Neutral image and Guts image appear to elicit a biphasic OR, which is characterized by a sideways *S* shape. With a biphasic OR, heart rate initially slows during the first two beats, and then accelerates to a peak by the seventh beat followed by a recovery to baseline levels by the tenth beat (Lang, 1990). In Figure 5.1 time, rather than individual heart beats, is presented. To assist with interpretation one heart beat could be assumed to be equivalent to one second. In Figure 5.1 heart rate increases with the Neutral and Guts image after the first two seconds or beats. Heart rate appears to peak around the fourth second or beat; slightly earlier than Lang's (1990) predictions. Finally, there is a return to baseline around the tenth second or heart beat, as Lang (1990) predicts. The Neutral and Guts image do appear to produce a biphasic OR. In contrast, it is unclear what type of OR occurs with the Artery image. It could also be a biphasic OR,

or alternatively, a monophasic OR, which is characterized by a *U* shape. With a monophasic OR, heart rate immediately decreases and peaks around the sixth or seventh beat before recovering to baseline by the tenth beat (Lang, 1990). The Artery image does appear to have a peak drop in heart rate at the sixth second or beat, but does not return to baseline as predicated by Lang (1990). This means that the Artery image does not display a classic monophasic OR. What is apparent with the cardiac curve of the Artery image is that there is a large change in heart rate which would suggest an OR occurred.

The trend analysis indicated that there was not a significant interaction between groups and time, $F(38,242) = 0.689$, $p = 0.916$. This indicates that the groups did not differ with respect to their cardiac response curves. A visual inspection of the cardiac curves does appear to show a difference, particularly between the Artery image and the other two images (Neutral and Guts). However, when error bars are included in these cardiac curves it becomes apparent that the differences among groups are small (see Figure 5.2).

Figure 5.2: Cardiac response curves with error bars for each image



This analysis did reveal a significant main effect for time, F(19,120) =1.951 p=0.016. Further analysis reveals that there was a significant cubic component (F(1, 138) =10.638 p=0.001) indicating that the three images all produced a biphasic OR. Consequently, although all three images captured attention, the disgust images captured no more attention than the neutral image. Thus, Hypothesis 5 is rejected. Disgust does capture attention; however, it does not better capture attention than a neutral image.

Memory and processing

A 3 (image) x 2 (message) MANCOVA was performed on the remaining memory and processing variables. There was not a significant interaction between Fear and Disgust conditions, F(12, 272) = 1.256, p=0.245. Similarly, there was not a significant main effect of Disgust, (F(12, 272) = 0.778, p=0.673). Disgust does not appear to make a message more memorable (via either message retrieval or encoding). Hypotheses 6a and 7a were rejected**.** There was a main effect of Fear, F(6, 135) = 17.335, p<0.001), although not in the anticipated direction. Table 5.2 shows the dependent variables which were affected by Fear (full details of means for these variables are in Appendix M.).

Table 5.2: Tests of between—subjects effects for memory and processing variables

Source	df	F	p
		Memory Variables	
Memory Retrieved- correct	1	0.407	0.525
Memory Retrieved- incorrect	1	1.562	0.213
Encoding- correct	1	25.627	>0.001
Encoding- incorrect	1	80.296	>0.001
		Processing Variables	
Time reading	1	0.022	0.882
Total thoughts	1	0.787	0.377

The results for the effect of fear on memory retrieval were not significant and so Hypothesis 6b is rejected. Hypothesis 7b predicted that a Fear message would increase message encoding. There is a significant main effect for Fear on message encoding, although this is in the opposite direction than anticipated (Fear did not increase message encoding). Instead, Fear significantly decreased message encoding. Hypothesis 7b is also rejected. This finding is described in detail in the message encoding section below.

In addition, a significant effect was found for the covariates of age, education, and relevancy ($F(6, 135) = 2.451 - 3.696$, $p=0.002 - 0.028$). The remaining covariates (importance of exercise, and disgust sensitivity) were not significant ($F(11, 135) = 1.255 – 1.813$, $p=0.101 – 0.283$). Table 5.3 shows which dependent variables were significantly affected by the covariates of age, education, and relevancy.

Table 5.3: Effect of Covariates on dependent variables

Covariate	Dependent variable	df	F	p	B
Age	Memory retrieval	1	12.964	>0.001	-0.087
	Total thoughts	1	4.161	0.043	-0.029
Education	Memory retrieval	1	5.680	0.019	0.586
	Time reading	1	4.485	0.036	-3.936
Relevancy	Total thoughts	1	13.408	>0.001	0.614

Age had an apparent negative effect on memory retrieval; an explanation which is difficult to provide. However, this study did have a large range of ages, with approximately 20% over 50 years old. It is plausible that older adults did not read the message closely because they may have read similar messages before. The message may not have been considered relevant or likely to provide new information. With total thoughts, age again has a negative impact. No explanation or speculation for this effect is

offered here. In contrast to age, education positively affected memory retrieval; an outcome that was expected. That is, more educated people were able to remember more. Education also had a negative effect on time spent reading. Thus more educated participants read the brochure faster. Finally, relevancy had a positive effect on total thoughts, with people who found the message more relevant generating more thoughts.

Message encoding

A follow up analysis of the encoding variables revealed that participants who read the Fear message identified fewer statements as being correctly in the brochure than did participants who read the No Fear message. In addition, participants who read the Fear message also identified more statements incorrectly as being in the brochure than did participants who read the No Fear message. In effect, the Fear message negatively impacted message encoding with participants missing statements that were in the brochure and identifying statements as being in the brochure, when in fact these statements were absent. Table 5.4 shows the means from this analysis.

Table 5.4: Mean scores and standard error for Message Encoding as a function of Fear manipulation

	Message	
Encoding Variable	Fear	No Fear
Number identified correctly as being in the brochure	3.08 (0.11)	3.86 (0.11)
Number identified incorrectly as being in the brochure	1.80 (0.09)	0.69 (0.09)

A possible alternative hypothesis could be that the Fear message contained language or material that was more difficult to process. Another analysis was performed to rule out this alternative hypothesis. The message encoding exercise required participants to identify statements that were and were not in the brochure. Of the ten

statements, six statements were common to both brochures. That is, three statements from the list were present in both brochures (Common Items In) and three statements were absent from both brochures (Common Items Out). A MANOVA was performed on these two variables to determine whether there was a significant difference with the type of message read. The results of this MANOVA were significant $F(2, 153) = 12.224$ $p>0.001$ and the between subject effects is presented in Table 5.5.

Table 5.5: Test of between—subjects Effects of common message encoding items

Encoding Variable	df	F	p
Common Items In	1	9.567	0.002
Common Items Out	1	12.531	0.001

In a similar outcome, participants who read the Fear message identified fewer common statements as being correctly in the brochure than did participants who read the No Fear message. Likewise, participants who read the Fear message correctly identified fewer common statements as being out of (or not in) the brochure than did participants who read the No Fear message. This means that even when statements were common to both brochures (either being in or absent) the Fear message negatively impacts message encoding. Table 5.6 shows the means from this analysis. In short, fear interfered with message encoding. Participants exposed to the fear message made more mistakes than did participants not exposed to the fear message.

Table 5.6: Mean scores and standard error for items common to all brochures

	Message	
Encoding Variable	Fear	No Fear
Common Items In	1.94 (0.08)	2.30 (0.08)
Common Items Out	2.12 (0.07)	2.45 (0.07)

Message Processing

Although there was not a significant effect for the total number of thoughts generated, a follow up analysis was performed to determine whether the type of thoughts generated were different among groups. Thoughts were coded as being either relevant or irrelevant to the brochure. For example, a relevant thought would include comments on physical activity. An irrelevant thought, in contrast would include comments unrelated to the brochure or physical activity. The relevant thoughts were subcategorized as being favorable, unfavorable, or neutral. The rationale for coding unfavorable thoughts was to determine whether the disgusting images or fear inducing message produced negative thoughts. If a large number of negative or unfavorable thoughts are produced then this could provide evidence that people will react and reject the message's recommendations.

A 3 (image) x 2 (message) MANCOVA (using age and relevancy as covariates, which were previously found to be significant) was conducted to discern any differences in the types of thoughts identified by each group. There was not a significant interaction between Fear and Disgust $F(8, 282) = 1.716$ $p=0.094$. In addition, there were not a significant main effects for either Fear $F(4, 140) = 0.343$ $p=0.848$ or Disgust $F(8, 282) = 1.346$ $p=0.221$. Therefore, there are no significant differences among groups on the types of thoughts generated (see Appendix M for table of means). This result, coupled with the nonsignificant result for time spent reading, means that the groups can not be differentiated based on the cognitive strategy used to process the message. The difference between central and peripheral processing, as conceptualized in this study, is that one involves more thoughts or more time spent reading. Central and peripheral processing is considered to be on a continuum with more thoughts generated, or more time spent reading, indicating greater reliance on central processing. Similarly, less thoughts generated or less time spent reading indicates more reliance on peripheral

processing. In order to determine which cognitive processing strategy dominates it is necessary to make a comparison between groups. There are not a definitive number of thoughts or amount of time that would state which cognitive processing style dominates. Because there are no differences among treatment groups (either by image or message) in this study, it is not possible to evaluate Hypothesis 8. Finally, there is no evidence of message reactance to any of the brochures.

BEHAVIORAL OUTCOME MEASURES

The following section reports results for dependent variables related to behavioral outcomes. Self—report physical activity behavior is reported first, followed by results from fitness test participation, information seeking behavior, and social diffusion.

Self—report physical activity behavior

A pretest ANCOVA confirmed that there were no differences among groups based on moderate physical activity ($p>0.05$). The 3 (image) x 2 (message) x 3 (time) repeated measures MANCOVA did not produce a significant main effect for time ($p>0.05$). This means that the brochures did not increase moderate physical activity (see Table 5.7 for the mean scores for moderate and vigorous physical activity.. The covariates were also not significant ($p>0.05$).

Table 5.7: Self-report physical activity in minutes per week (standard error)

	Time Point		
Image	Pre—intervention	Post—intervention	16d Post intervention
	Moderate Physical Activity		
Neutral	178.29 (33.63)	166.85 (32.28)	172.19 (36.15)
Artery (D1)	182.11 (32.33)	179.28 (31.03)	150.86 (34.75)
Guts (D2)	166.04 (33.23)	174.71 (31.92)	190.13 (35.72)
	Vigorous Physical Activity		
Neutral	101.35 (17.80)	113.57 (16.92)	91.85 (29.07)
Artery (D1)	109.34 (17.11)	116.37 (16.26)	104.21 (27.95)
Guts (D2)	89.52 (17.60)	119.52 (16.73)	138.90 (28.75)

Table 5.8 provides the multivariate test results from this analysis. Without a main effect for time or for any interactions it can be concluded that none of the treatments conditions successful managed to increase moderate physical activity and that there were not any differences among groups. Therefore, Hypothesis 9 is partially rejected.

Table 5.8: Multivariate tests outcomes for repeated measures MANCOVA on moderate physical activity

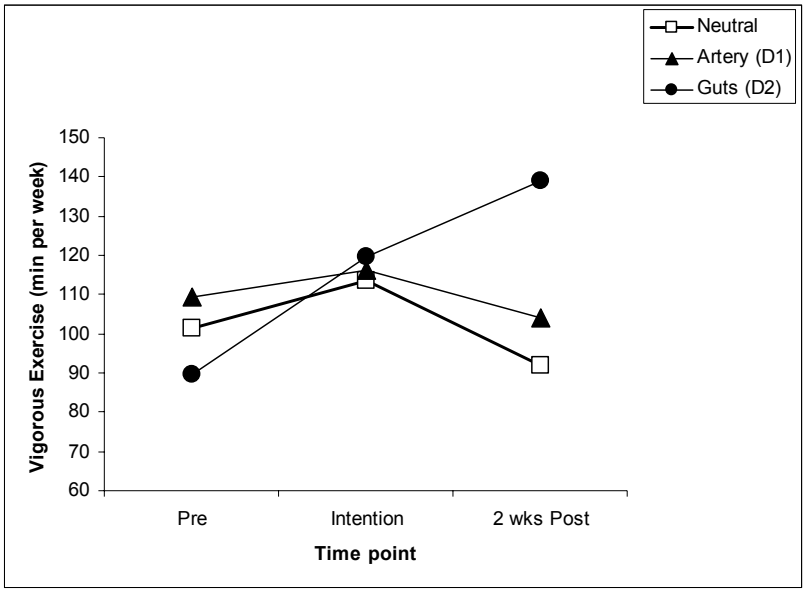
Source	F	Df	Error df	p
Mod PA	0.126	2	126	0.882
Mod PA x Fear	2.367	2	126	0.098
Mod PA x Disgust	0.883	4	254	0.475
Mod PA x Fear x Disgust	1.276	4	254	0.280

For vigorous physical activity the pretest ANCOVA confirmed that there were no significant differences among groups ($p>0.05$). The 3 (image) x 2 (message) x 3 (time) repeated measures MANCOVA did produce a significant interaction between Disgust and Time ($F(4, 254) = 2.432$, $p=0.048$). There were no other significant differences and this is summarized in Table 5.9. The mean scores for the Disgust x Time interaction are reported in Table 5.7 and graphed in Figure 5.3.

Table 5.9: Multivariate tests outcomes for repeated measures MANCOVA on vigorous physical activity

Source	F	Df	Error df	p
Vig PA	0.099	2	126	0.906
Vig PA x Fear	0.219	2	126	0.804
Vig PA x Disgust	2.432	4	254	0.048
Vig PA x Fear x Disgust	0.796	4	254	0.529

Figure 5.3: Disgust x Time interaction for Vigorous Exercise



Decomposition of the interaction yielded no significant pairwise comparisons between image within each level of time. The largest separation appears to occur at the 16 days Post intervention time point. At this point in time, participants exposed to the Guts image report much higher levels of vigorous activity than do those exposed to the Neutral or Artery image. Based on this figure, Hypothesis 9 is partially supported.

Information seeking

A single dependent variable (Number of brochures taken) was used to measure information seeking. There was no significant interaction between Disgust and Fear $F(2, 140)= 0.134$ $p=0.875$. In addition, there was no effect of Fear ($F(1, 140) = 0.233$, $p=0.630$). However, there was a significant main effect for Disgust ($F(2, 140)= 3.657$, $p>0.05$). The mean scores for number of brochures taken for each Disgust condition are presented in Table 5.10.

Post hoc analysis using least significant difference (LSD) revealed that the Guts image was significantly different from the Neutral image ($p=0.016$) and the Artery image ($p=0.029$). There were no other significant differences among groups. It appears that participants exposed to the message containing the Guts image engaged in greater information seeking behavior than did the participants exposed to the Artery or Neutral image. Based on these results, Hypothesis 10 is partially supported.

Table 5.10: Mean Scores for Number of brochures taken as a function of Disgust manipulation

Image	Mean	Std. Error
Neutral	4.19	0.40
Artery	4.34	0.40
Guts	5.57	0.39

Fitness test initiation

Three stages of Fitness test initiation were recorded. The stages progressed from contacting FIT (Contact), booking an appointment with FIT (Booked), and completing a fitness evaluation with FIT (Fit Test). In total 41 (26.3%) coupons were redeemed.

Results from the binary logistic regression were not significant for any of the treatment conditions. Subsequently, the independent variables were not successful in predicting whether participants would contact, book, or engage in a fitness evaluation. Thus, Hypothesis 11 was rejected. Table 5.11 shows the model fit statistics information for each of these stages. With this analysis the -2 log likelihood statistic provides a measure of how poorly the model predicts fitness test initiation behaviors. Lower values indicate a better model. The Cox & Snell R^2 statistic can be interpreted similar to the R^2 statistic in multiple regression (i.e., the amount of variance explained by the predictor variable).

Table 5.11: Model fitting for Binary logistic regression

	Omnibus Tests of Model Coefficients			Model Summary	
Fitness test initiation	Chi—Square	df	p	-2 log likelihood	Cox & Snell R^2
Contact	3.408	5	0.637	183.151	0.024
Booked	2.491	5	0.778	174.870	0.017
Fit Test	4.169	5	0.525	175.539	0.026

Participants were asked to explain their reasons for not using the fitness test coupon. One hundred and forty—four people (92.3% response rate) returned the post—experiment questionnaire. Forty—one people used their coupon. There were 103 people who provided reasons for not using their coupon. In total, 121 reasons were recorded.

Participants' responses were grouped into similar categories (see Table 5.12). The most frequently expressed reason was a lack of time (n=42). Participants also stated that the coupon expired too soon (n=31). Some participants were not interested in the coupon (n=13), whereas others had recently had, or where going to have, a fitness evaluation elsewhere (n=11). Other reasons provided by participants were that they were concerned about the test, they forgot about the coupon, it was inconvenient to redeem, they were sick, they lost the coupon, and they were worried that it would involve a sales pitch.

Table 5.12: Reasons for not redeeming coupon

Reason	Frequency
Lack of time	42
Coupon expired too soon	31
Not interested in fitness test	13
Recently had, or plan to have, fitness test elsewhere	11
Concerned about taking the test	8
Forgot about coupon	6
Inconvenient to redeem coupon	5
Sick	3
Lost coupon	1
Worried about sales pitch	1

Social Diffusion

Participants were asked to indicate how many people they had told about the brochure, the fitness test offer, or the Fitness Institute of Texas. Informing others is a form of social diffusion. Thus, greater levels of social diffusion are indicated by higher

number of people informed. No significant effects were shown via the ANCOVA on any of the social diffusion variables ($p>0.05$). Table 5.13 reports the extent of social diffusion. Based on these outcomes, Hypothesis 12 is rejected.

Table 5.13: Mean scores for social diffusion variables

	Number of people told about		
Source	Brochure	Fitness Test	FIT
All Brochures	1.88 (2.06)	2.06 (2.01)	0.97 (1.77)

SUMMARY

Twelve hypotheses were examined in this study. Table 5.14 provides a summary of each hypothesis and the outcome from testing each hypothesis.

Table 5.14: Summary of results

Hypothesis	Outcome
H1: The inclusion of a disgusting image will enhance the fear experienced from a fear and no fear health message.	Rejected
H2: Different types of disgust (animal—nature and moral disgust) can be quantitatively differentiated in a health message advocating physical activity.	Rejected
H3: The combination of disgust and fear will enhance the outcomes related to memory and physical activity.	Rejected
H4: Disgust and fear will not differ on outcomes related to memory and physical activity.	Rejected
H5: A health message that includes a disgusting image will better capture attention than will a health message that does not include a disgusting image.	Rejected- though disgust did capture attention

H6a: A health message that evokes disgust will enable more information to be retrieved from memory than will a health message that does not evoke disgust.	Rejected
H6a: A health message that evokes fear will enable more information to be retrieved from memory than will a health message that does not evoke fear.	Rejected
H7a: A health message that evokes disgust will enable more information to be encoded into memory than will a health message that does not evoke disgust.	Rejected
H7b: A health message that evokes fear will enable more information to be encoded into memory than will a health message that does not evoke fear.	Rejected- fear negatively affected message encoding
H8: A health message that evokes animal—nature disgust will be centrally processed.	Unable to determine
H9: A health message that evokes disgust or fear will result in more physical activity behavior (moderate and vigorous) than will a health message that does not evoke disgust or fear.	Moderate activity- rejected Vigorous activity- accepted for high disgust image
H10: A health message that evokes disgust or fear will result in more information seeking behavior than will a health message that does not evoke disgust or fear.	Partially supported- high disgust image increased information seeking
H11: A health message that evokes disgust or fear will result in more fitness test redemptions than will a health message that does not evoke disgust or fear.	Rejected
H12: A health message that evokes disgust or fear will result in more social diffusion of the health message than will a health message that does not evoke disgust or fear.	Rejected

A highly disgusting image was shown to increase vigorous physical activity and information seeking. An image that evoked disgust did capture attention; but no more than a neutral image. The inclusion of an image that evokes disgust was found not to increase the amount of fear experienced. Moreover, the combination of disgust and fear in a brochure did not enhance memory or any physical activity related behaviors. Disgust and fear produced different outcomes. Fear was shown to negatively affect message encoding, a component of memory.

Chapter Six: Discussion and Conclusions

This study supports the use of disgust to persuade people to increase their physical activity. An increase in physical activity can improve one's health, reduce weight, and improve body composition. This study shows that health messages that evoke disgust can contribute to the fight against obesity. In this study three images were used to produce three levels of disgust intensity. High levels of evoked disgust were found to be more effective then no, or medium, levels of evoked disgust[2]. This has implications for social marketers and public health practitioners who design health messages. Specifically, a health message that incorporates highly disgusting images may be effective in changing behavior. People who read a brochure with a highly disgusting image sought out more health information than did those who read a brochure with a moderately disgusting or neutral image. This is an important outcome because it demonstrates that people want more information, presumably because they have become more interested or concerned about their health. The fact that people want more information helps the social marketer and health professional to disseminate health information. The original health message does not need to contain a huge amount of information. Instead, the message can be designed to hook the audience and provide access to further information (such as a website address). Unexpectedly, this study demonstrated that disgust does not increase fear evoked by a message. Furthermore, fear was shown to impede message encoding- an undesirable outcome. From a public health practitioner's perspective this has implications for the design of persuasive messages. In particular, a memorable and effective message should avoid evoking fear.

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[2] Previous chapters have referred to the three levels of disgust based on the image used (neutral, artery, guts). However, because different levels of disgust produced different outcomes the images will now be referred to as Neutral, Medium, and High disgust.

Disgust and fear differed in their impact on memory, physical activity, and information seeking. Because disgust and fear appear to affect cognitive processing and persuasion differently, this strengthens the argument for future research to focus on discrete emotions, rather than focus on combinations of emotions bundled into dichotomous labels such as positive and negative. If emotions have different effects, then research on discrete emotions can determine these effects along with any moderating or mediating variables. Research that combines emotions into dichotomous terms or composites of several emotions risks having the results confounded. Because disgust was shown not to augment fear, and disgust produced positive outcomes, the public health practitioner or social marketer becomes better equipped to design effective health messages. These outcomes are discussed in more detail below. In the next section the behavioral outcomes are discussed first followed by a discussion of the way in which disgust and fear are cognitively processed. An examination of the way in which disgust and fear differ is then presented before limitations are discussed and a general conclusion provided.

BEHAVIORAL OUTCOMES

A major finding from this study was the effect disgust had on self report vigorous activity. Participants reported significantly higher levels of vigorous activity after exposure to the high disgust image. The level of vigorous activity reported prior to the experiment was similar among all groups. After reading the brochure, all groups reported an intention to increase their vigorous activity. However, 15 days after the experiment, the neutral and medium disgust groups' reported level of vigorous physical activity was similar to the level reported prior to the experiment. The high disgust group reported increasing their level of vigorous physical activity beyond their own reported intentions. Participants exposed to the high disgust image appear to increase their vigorous activity

more than they intended. This is an exciting outcome because it suggests that evoking high levels of disgust can be very effective in changing behavior.

Participants in this study appear to be highly active and are currently meeting the recommendations for vigorous activity provided in the brochures. This is of interest because it demonstrates that evoking disgust in highly active people can influence these people into becoming even more vigorously active. Disgust may serve to motivate these individuals to increase their level of vigorous physical activity in order to avoid the outcome depicted in the image (increased abdominal fat). The participants in this study were University employees and it was not expected that they would be so physically active. This raises the question of whether evoking high levels of disgust would be effective with a less active population. It is possible that evoking disgust would also motivate less active people to increase their physical activity. Future research should consider investigating the effect of disgust with people who are less physically active. Based on these results caution should be used when generalizing the results from this study to other, less active populations.

In contrast to vigorous physical activity, there was no reported difference among groups on moderate exercise. Groups did not differ on their initial reported level of moderate activity, their intentions, or subsequent post experiment reported level of moderate activity. Moderate exercise was described in the questionnaire and brochure as including such activities as walking, bicycling and household chores. Exposure to these brochures did not have any effect on these types of activities. A possible explanation for why moderate exercise did not increase in any group is because it was not perceived as being an effective method for improving health. Witte (1992), in the context of fear appeals, would describe this as a lack of response efficacy. If the message recipient does not perceive that the prescribed action (i.e., the response) will successfully remove the

threat then they are not motivated to carry out the action. Thus, moderate physical activity may not have been perceived as a response that would improve health or prevent disease. Subsequently, participants may not have been motivated to comply with this particular recommendation from the brochures.

Alternatively, moderate physical activity may have succumbed to a ceiling effect. Many people carry out a number of daily activities (i.e., walking or chores) already. The amount of moderate physical activity reported starts off fairly high leaving limited opportunities to actually increase these types of activities. Participants in this study were averaging close to three hours of moderate activity a week. This level of moderate activity is close to the recommendations provided in the brochures. Time spent performing moderate physical activity was substantially (approximately twice) higher than time spent performing vigorous physical activity. Even if people increased moderate physical activity, any increase would be small in comparison to their baseline level of activity. This would make it difficult to statistically notice such a small change. A larger sample size may therefore be needed to increase the sensitivity of the data analysis.

As well as having an impact on a specific health behavior, the goals of a public health campaign may extend to include other components. These include motivating people to increase their knowledge, spread the word, and have a health checkup. This study investigated each of these facets and discusses each in turn.

People exposed to the high disgust image sought out more information by taking more brochures. This is a notable outcome because it demonstrates that evoking high levels of disgust influences a positive behavioral outcome. People who see the high disgust image want more information. Exactly why this occurs is unclear. It may be because disgust makes people more interested in the topic. Subsequently, they want to

know more about the topic. Alternatively, people may seek out information to find some way to help alleviate the emotion. This proposition is very similar to Witte's (1992) danger control mechanism where fear motivates people to remove the danger by adhering to the message's recommendation. Exposure to an image that evokes disgust may increase health concerns and subsequently people may seek out information to alleviate this affective state.

Previous studies have also shown that people exposed to disgusting imagery want more information. Janis and Feshbach (1953) noted that participants who saw disgusting imagery felt that more information needed to be provided. More recently, Hammond et al. (2004) reported that people who bought cigarette packets with disgusting images wanted more relevant information. These two studies demonstrate that people exposed to a disgusting image want more information. The present study differs from previous research in that behavior was observed and recorded rather than intentions or desires. Observing behavior rather than recording intentions or desires is a superior measure. Moreover, it provides validity to the finding that highly disgusting images increases information seeking behavior.

The results from the present study have important implications for public health practitioners and social marketers. First, disgust can turn people onto, rather than off of, a topic. This, ultimately, may lead to a positive behavioral change. Because people want more information, it would seem prudent to facilitate people's search for this information. Messages that use disgust should provide information on ways to find out more about the topic being presented. This could be in the form of websites, help telephone lines, or information packets. Because disgust promotes a desire for more information, practitioners need not concern themselves with producing messages that contain all the facts. Instead, providing people with easy and convenient ways to access further

information would seem to be more practical. The important point is to evoke high levels of disgust so that people become interested or motivated to find more information, and then to provide easy access to this information.

Along with increasing information seeking, a public health campaign may also benefit from people talking about the issue being promoted. If people talk to others then this may increase awareness and interest in a health issue. As more people talk to others the information diffuses through the community. This increase in public discourse and social diffusion of information may enable the public health practitioner to allocate fewer resources to advertising and more to other areas, such as operations. In the present study however, there were no reported differences among groups based on the number of people the participants talked to about the brochure, the fitness test, or FIT.

There are several explanations for why there were no differences in social diffusion among groups. First, although a disgusting image was included in the brochure, the actual message itself was not disgusting. It was assumed that the gestalt of image and picture would result in people talking about the contents of the message. If the reason for passing on this information is because it is scarce or taboo then the contents of the message must reflect this; they must evoke disgust and interest in the message recipient which would also entertain the listener. The contents of the message were factual, and it is probable that people have previously been exposed to similar material. The topic of physical activity is not novel- even if some of the information was new (such as how much vigorous exercise is required). Thus, not only is the information not taboo (i.e., the message was not disgusting), it is not scarce. Subsequently, people may not have been motivated to pass this information along.

Although the message was not disgusting, the image was. Therefore, based on the above argument one would have expected that people would have talked to others about

the image. A second reason for why a significant difference was not found may have been in the design of the post experiment questionnaire. This questionnaire asked participants how many people they had talked to about the brochure. Follow up questions then asked participants to indicate if they had told people about the information in the brochure and the image in the brochure. These were phrased as simple dichotomous yes/no questions. Therefore it was not possible to determine exactly how many people were told about the information or the image. For example, a participant may have indicated they told 10 people about the brochure. Because of the framing of follow up questions it was not possible to know if all 10 people were told about the information and all 10 people about the picture. Conceivably, one person could have been told about the information and 10 people about the image. However, this was not possible to determine from the instrument used in this study.

A final possible reason why no differences were found may be in the limited exposure participants had to the image. On average, participants read the brochure in two minutes. Therefore, they were only exposed to a single, relatively small (3 x 2.5") image for two minutes. This small image was embedded within a much larger area of text. Subsequently, the effectiveness of this image to evoke disgust may have been muted. The images used in Pilot Study Three appear to have been more effective in evoking disgust. For example, in Pilot Study Three the mean amount of disgust evoked by the highly disgusting image (exposed abdomen) was 3.32 on a 5 point scale. In contrast, in the main study the mean amount of disgust evoked by the same picture was 2.76 on a 7 point scale. It is possible that the image evoked more disgust in Pilot Study Three because it was the focal point of the intervention. In the main study, the image is no longer the sole focus of attention and subsequently, its effectiveness to evoke disgust is diminished. It may be that higher levels of disgust are needed for social diffusion to

occur. Higher levels of disgust may require larger images, more exposure time, more images, or some combination thereof. Future research may therefore need to account for these factors. In addition, the source of the disgust needs to be investigated. Research could compare disgusting images with disgusting text to determine the extent to which these increase social diffusion. Research in this area would increase our understanding of the way in which disgust influences social diffusion and provide recommendations for the design of health messages.

An integrated public health or social marketing campaign may want people to change their behavior, increase their knowledge, and talk about the issues. In addition, a frequent goal of a campaign may be to have people participate in a diagnostic test. For example, AIDS campaigns promote safe sex and condom use; in addition they often encourage people to be tested for AIDS. The same could be said for other conditions such as prostate cancer, and high blood pressure. The brochures used in this study advocated physical activity. Moreover, participants were encouraged to have a fitness test to determine their current level of fitness and to motivate exercise participation. The redemption of the fitness test coupon involved three stages; contacting the Fitness Institute of Texas (FIT), booking the appointment; and attending the appointment. There were no differences among groups on any of theses stages. The rationale behind measuring multiple stages was to determine degrees of commitment. Not all people who contact FIT may have followed through with redeeming their coupon. However, because there were no differences among groups only the actual redemption of the coupon will be discussed.

Twenty—six percent of the participants used their fitness test coupon. A possible explanation for why there were no observed differences is because the offer was too attractive. Participants may have been quite interested in having a fitness test. Only 13

responses (12.6%) stated that the coupon was not used due to a lack of interest in having a fitness test. Participants may have also valued the fitness test and felt they were getting a good gift for participating. A relatively large number (10.7%) stated that had recently had or were going to have a fitness test. The fact that people are having fitness tests elsewhere provides some evidence that these tests are a valued commodity. Redemption of the coupon was also made relatively easy. The location of the experiment and FIT are in the same building. Because participants were University employees, this would have been within walking distance for them. Only five people indicated that the location or booking procedure stopped them from redeeming the coupon. Perhaps not surprisingly the main reasons for not redeeming the coupon were due to lack of time (40.8%) and because the coupon expired too soon (30.1%). Fifteen days was considered a reasonable amount of time to redeem the coupon; it is questionable whether a longer expiration date would have dramatically changed the outcome.

Discussion on behavioral outcomes

The findings from the present study support the use of disgust to persuade people to increase their physical activity. The participants in this study were already physically active and it not known whether the use of disgust would produce similar outcomes with a less physically active population. In addition to this outcome, the use of disgust motivates people to seek out more information. These results suggest that in order for behavioral change to occur, higher levels of disgust should be evoked. Disgust continues to influence behavior after the stimulus has been removed. Consider that a) participants were unaware that they would receive the final questionnaire and that b) this questionnaire was sent out over two weeks after having read the brochure. Also, bear in mind the limited exposure time and the actual magnitude of disgust evoked in the higher disgust treatment. These factors seem to suggest that disgust can be a persuasive emotion

when carefully designed in a health message. Furthermore, although higher levels of disgust are needed, the actual magnitude of evoked disgust necessary to produce change does not need to be extreme. Why disgust has these effects is unclear. Up to this point potential explanations have been that disgust increases interest, and it creates a negative affective state which one is motivated to alleviate. To understand more it may be prudent to examine the results pertaining to cognitive processing.

COGNITIVE PROCESSING

Three areas of cognitive processing were investigated in this study; attention, memory, and processing style. Each of these areas is discussed in turn. With attention messages that contained a disgusting image did produce orienting responses (OR) and this indicates that these messages were successful in capturing attention. However, the neutral image also captured attention. Regardless of which image was used, the brochures were all successful in capturing attention. Based on the Limited Capacity Model (Lang, 2000) of message processing an OR has to occur before more mental resources are automatically applied to process the incoming message. Expressed in another way, before a person can process a message they must attend to the message and this requires an OR. In this study participants had to wait until a brochure was place in front of them and then given instructions to start reading a brochure. In order to comply with the request to read, participants had to orient themselves to the message. It would appear that a primary reason that the images did not differ in terms of generating an OR was because of the experimental procedure. In fact, other researchers have also encountered this problem with non—experimental or control conditions producing ORs.

Lang, Chung, Lee, and Zhao (2005) reported that pictures of risky and comparable nonrisky products (e.g. beer bottle and soda bottle**)** both produced OR. However, the type of OR in their study actually differed, whereas in the present study

there were no differences on the type of OR produced. Specifically, Lang et al. (2005) reported that risky pictures produced a biphasic OR and nonrisky pictures produced a monophasic OR. The authors suggested that the difference may be due to speed of identification such that risky pictures were identified quicker. The fact that different images are identified more quickly may be an adaptive response i.e. survival purposes. Thus identifying a risky image quickly may be important to prevent harm or avoid danger. Based on this discussion, one would have expected that the neutral image in this study (the State capital building) would have been interpreted as a nonrisky image, speed of identification would have been slower, and subsequently a monophasic OR produced. Instead, in the present study, the neutral image produced a biphasic OR. It would appear that speed of identification is not a sufficient explanation for why different images produced different types of OR. Future research on ORs should investigate whether different ORs are produced by different categories of stimuli.

The experimental protocol used in Lang et al.'s (2005) study was similar to the present study in that participants were quickly exposed to the image at a set time. Thus an artificial or mandatory OR was produced. It would therefore seem important that future research on the effect of disgusting images needs to consider the way in which these images are revealed or presented to the participant. It might be prudent to use naturalistic environments, such as the one used by A. Miller (2006). In her experiment, participants were unaware the study had started. Using Eyes On Screen (EOS) to measure attention, A. Miller (2006) was able to show that disgusting stories were attended to more than fearful stories. Measuring attention using EOS would seem to produce a more valid measure of attention that using procedures where participants must focus on stimulus materials. Using EOS or a naturalistic environment would be a suitable extension to the current research. Moreover, understanding whether, and under

what circumstances, disgust captures attention would be important for the public health practitioner and social marketer. A prerequisite to persuasion is that one must attend to the message. People are constantly being bombarded with messages and information. As part of an integrative marketing campaign, a public health announcement or advertisement may be subjected to limiting funding, resulting in fewer exposure opportunities and greater competition from other advertisements. Subsequently, advertising needs to be effective in capturing attention. If disgust can help cut through the clutter, then it may be a suitable emotion to evoke in a health message.

Capturing attention may be the initial step to behavior change. Remembering the message may be needed for continual behavior change. In this study two aspects of memory were studied; retrieval and encoding. There were no differences among the disgusting and neutral images for memory retrieval or encoding. This was unexpected because it was assumed that a disgusting image would be alluring and more mental resources would be devoted to processing the message. A possible explanation for why there were no observed differences is because the information that was processed was brief and familiar. It is not inconceivable to assume that the length of the brochure and the subject would have reduced the likelihood of a difference being observed. The length of the brochure was relatively short (532 words) and required on average two minutes to read. There was not a huge amount of information to process or remember. Moreover, memory was assessed shortly after having read the brochure. In effect, short—term memory of a relatively small amount of information was assessed in this study. A suitable extension to the current study would be to determine whether disgust affects longer term memory. If disgust is more memorable over longer durations, then it may explain the effect of disgust had on physical activity. In addition, many people are familiar with the topic of physical activity. It would not be surprising if participants had

previously read or heard some of the statements and recommendations made in the brochure. Another plausible explanation for disgust not having an effect on memory is because participants used long term memory or existing schema to help them retrieve facts and recommendations. Because the facts and recommendations are familiar, participants were more able to easily recall these facts or, basically guess what facts were provided in the brochure. A suitable extension of the present study would be to determine whether disgust affects short term memory when the message is unfamiliar to the reader.

In contrast to disgust, fear did have an effect on memory, but not in the anticipated direction. A message that evokes fear appears to hinder message encoding. Specifically, participants made more mistakes when choosing which items were in the brochure and which items were absent. An alternative explanation may have been that language that evokes fear is harder to encoding. However, participants who read the fear message made mistakes regardless of the type of language used. Subsequently, one is left with the conclusion that fear negatively impacts message encoding.

This finding was unexpected because fearful messages have been considered to be more memorable than non fearful message (Hale & Dillard, 1995; Schneider et al., 2001; Sturges & Rogers, 1996). The rationale for this is because the appraisal of the information in these messages would be thought to have important consequences (Scherer, 1999). It is expected that when fear is evoked information will be encoded correctly (Wessel & Merckelbach, 1998). In contrast, the present study found that when fear is evoked information was encoded incorrectly.

Lench and Levine (2005) have reported similar results. In their study, participants completed a number of questionnaires before having an emotion induced. An emotion was evoked in participants by having them write about an event that made

them feel the emotion intensely. A surprise memory test on the previously completed questionnaire revealed that fear led to poorer memory. Similar to the present study, participants in Lench and Levine's (2005) study recalled few items correctly and recalled more items incorrectly.

However, a primary difference between these two studies, is that in the present study, the emotion was evoked by the material that was subjected to the memory test. Participants were asked to indicate items they recalled as being present in the brochure. These findings actually provide stronger support than those of Lench and Levine (2005) that fear negatively impacts message encoding. Lench & Levine (2005) suggested that fear motivates people to ignore or discount threatening information, particularly when there is not an immediate response that will remove the threat. In effect, people 'switch off' to the message. If fear does cause people to ignore the message then we would expect that memory retrieval would also suffer. However, there were no differences in memory retrieval between the fear and no fear message.

A possible explanation for this is that the topic area is reasonably familiar to people. Thus it would be possible for people to use long term memory or existing schema to recall facts and recommendations that the brochure would likely make. There appears to be some evidence to support this assertion. The content analysis of participants' free recall task revealed a trend of participants' remembering similar incorrect information. For example, participants often recalled that exercise should be broken into ten minute chunks- a recommendation that did not appear in the brochure. However, this information may have likely been received by the participants at another time- for example, a while reading a fitness article or watching a PSA. In any event, the fact that participants made similar errors regardless of experimental condition suggests that different cognitive strategies were utilized to retrieve information. Furthermore, the

groups did not differ based on the number of incorrectly recalled facts and recommendations. Based on these findings it is quite possible that, because the topic was fairly well known to the participants, they were able to rely on existing schema of exercise and, in effect, correctly guess what was in the brochure.

A plausible explanation for this mechanism may be the way in which mental resources are divided while reading a fearful message. Rather than carefully processing the message, people may simultaneously be searching their schema of the topic for ways to combat their fear. People are motivated to reduce their fear (Witte, 1992). To do so, people may read the message and follow the message's recommendations. People can also search their memory for information on the topic that has caused the fear. Both strategies may provide solutions for removing their fear. However, a primary assumption of the Limited Capacity Model of information processing is that processing information requires mental resources. And these resources are limited. If a person is reading a fear message, and trying to search their memory for strategies to combat the fear, then their mental resources are being divided. Some resources are being applied to processing the message, while others are applied to retrieve information from a different source (i.e., long term memory). People may be able to retrieve information from existing schema to alleviate their fear if the message is based on a familiar topic (i.e., physical activity). For example, one could retrieve information on different types of physical activity. People may recall information that they know, rather than what they have just read. Because the topic is familiar, memory retrieval does not appear to suffer. In effect, participants are able to correctly guess what was in the brochure based on existing schema. However, because mental resources are being divided (some to search memory, others to encode the message) some aspect of message processing has to suffer. Message encoding is a more sensitive measure of memory then message retrieval (Lang, 2000). If fear does

negatively affect memory then we would expect this to manifest itself by impairing message encoding. This is precisely what is observed in this study. Subsequently, fear causes message encoding to suffer.

Based on the above discussion one has to wonder whether message retrieval would be negatively impacted by fear if the message was unfamiliar. It may be that with a relatively unknown or novel topic (such as a new disease) message retrieval also suffers. In effect, mental resources are still divided as some are applied to process the message and others to search for relevant information from existing schema. The difference in this scenario is that there is no existing schema available to reduce the fear. Subsequently message retrieval suffers. Alternatively, the absence of long term memory might facilitate message encoding. Because the topic is novel it may be that fewer mental resources are devoted to retrieving items from existing schema. Subsequently, more resources are available for message encoding; meaning that fear would not negatively impact encoding.

Another important observation to acknowledge is that even though fear was evoked, the message did contain a strong efficacy component. Efficacy is thought to be an important determinant of the message's recommendation (Witte & Allen, 2000; Witte, Meyer, & Martell, 2001). This potentially rules out an alternative hypothesis that the fear was so great that participants felt they could do nothing to control the danger, and subsequently sought to control their fear. This would be achieved by ignoring the message.

A potential future line of enquiry would be to determine the way in which fear affects message processing and memory. In particular, future research could compare the way in which fear affects message encoding and retrieval with familiar and unfamiliar topics. This would have important implications for public health practitioners because it

could indicate under which circumstances it is appropriate to use a fear message and the amount of new information these messages should contain.

To summarize the previous discussion, disgust did not affect memory and fear negatively affected message encoding (an aspect of memory). This is an important observation because health messages often combine disgust and fear to design a more effective message. The results from this study would suggest that public health practitioners should consider keeping the disgust and removing the fear from messages. Another consideration that public health practitioners should consider is the processing style that is used in message processing.

In this study a thought listing task and time spent reading were used to determine processing style. The results of these measures revealed no differences among groups. This is problematic because determining processing style is based on a comparison. The Elaboration Likelihood Model conceptualizes central and peripheral processing lying on a continuum. Processing style is not thought to be a dichotomous variable. All that can be inferred from results from measurements is that one processing style was more pronounced or utilized. There are not a definitive number of thoughts or amount of time that would indicate one or the other processing style occurred. To determine which processing style dominates we compare the number of thoughts listed or the amount of times spent reading. More thoughts or time spent reading equates to central processing dominating. In contrast, fewer thoughts or less time spent reading equates to peripheral processing dominating. However, without a difference among groups it was not possible to determine which processing style dominated in this study.

A potential confound to this experiment is that both brochures did contain personalized language and this would have increased motivation to elaborate or centrally process the message (Burnkrant & Unnava, 1989). Both brochures were designed using

materials from previously published brochures. Personalized language was probably included to make the message more relevant to the reader. Furthermore, the thought listing exercise may have been influenced by the message topic. Coverage in the media of the obesity and overweight issue and the importance of physical activity has increased. Subsequently people may have more access to their thoughts and opinions which would likely increase the number of thoughts listed. Had a relatively unfamiliar topic been used a more accurate measure of how the message influenced cognitive processing may have occurred. However, based on this study processing style can not be determined or recommendations made for message design.

General discussion on cognitive processing

In the present study it was anticipated that the results from examining cognitive processing would help with explaining the behavioral outcomes. In particular, it was expected that disgust would capture attention, be more memorable, and lead to greater message elaboration. The results from the present study are not conclusive. One suggestion has been for future research to focus on the effect of disgust on long term memory. Disgust has been suggested as an emotion that lingers and is problematic to eliminate (W. Miller, 1997). If disgust is more memorable in the long term in may motivate continual behavioral change. The reminder of disgust may motivate people to continue to comply with the message's recommendation. The present study provides some support for this statement. Participants who read a disgust evoking message complied with the message's recommendations and increased their self reported vigorous physical activity behavior. This behavioral change was reported 16 days after reading the brochures. Sixteen days may not be considered a long time, however, an earlier study has reported behavior change five months after being exposed to a disgust evoking message.

Leventhal and Watts (1965) reported that participants who watched scenes from a lung cancer operation led to more participants quitting or reducing smoking compares with a less graphic video. As has been discussed, this type of message may well have evoked strong feelings of disgust. Thus being exposed to a disgusting message motivated participants to continually attempt to change their behavior over a long period of time. It would seem appropriate to determine whether disgust is more memorable. In particular, understanding the mechanism of the way in which disgust affects memory should be investigated. Understanding the mechanism may have implications with the design of messages. One potential mechanism may be that disgust could increase people's access to their attitude towards the message. In other words, people may know more clearly what they think about a topic.

If people feel more disgust, it may have a more pronounced effect on their attitudes or values towards the advocated action; in this case vigorous physical activity and information seeking behavior. Consequently, people may have more access to their attitudes, or know the way they think and feel about a topic. Increasing accessibility to one's attitudes has been shown to increase behavioral intentions (Roskos—Ewoldsen, Yu, & Rhodes, 2004). The concept behind attitude accessibility involves using a network model of memory. A stronger network, or linkages between a topic and one's attitude towards that topic is thought to make memory retrieval of that attitude easier. Once an attitude is retrieved then behavior related to that attitude should occur (Fazio & Roskos—Ewoldseb, 1994). Disgust may strengthen the linkage between a topic and an attitude because disgusting things are often novel or involve unusual or taboo topics. Furthermore, disgust motivates a strong response (Lazerus, 1991). If disgust does strengthen attitude accessibility then one would assume that disgust would improve memory of a message. Based on this discussion, it is recommended that future research

on the effect of disgust on memory evaluates long term memory and attitude accessibility.

In the previous sections the way in which disgust and fear affect behavior and are cognitively processed was discussed. Disgust and fear produced different outcomes in terms of behavior and cognitive processing. Moreover, it was recommended that public health practitioners keep disgust and remove the fear from messages. Disgust and fear are separate emotions. However, these two emotions have often been used synonymously. In this next section the distinction between disgust and fear is discussed along with a closer look at the way in which fear has been conceptualized in previous research.

THE DIFFERENCE BETWEEN DISGUST AND FEAR

It was expected that the inclusion of a disgusting image would augment the fear experienced from a fear and no fear health message. Moreover, the combination of disgust and fear was expected to augment behavioral outcomes and memory. This did not happen. Instead, disgust did not impact fear or contribute to any outcomes related to fear. Disgust and fear produced separate outcomes. Because disgust and fear have similar action tendencies (i.e., both motivate avoidance) it was expected that these emotions would produce similar outcomes. Again, this did not happen. Instead, disgust and fear appear to be discrete emotions which influence separate outcomes.

Previous research has often differentiated between low and high fear conditions by including disgusting images (e.g., Dziokonski & Weber, 1977; Janis & Feshbach, 1953; Leventhal & Trembly, 1967; Rogers & Mewborn, 1976). The images used in these studies would be expected to evoke disgust. In the present study it was reported that disgust and fear had separate effects on persuasion. It would seem important to know which emotion (either disgust or fear) dominates in a health message because one should

know which emotion to contribute the outcome. By not knowing which emotion causes which effect we are at risk of providing inappropriate recommendations to practitioners and future researchers. For example, the conclusion that a disgust message negatively impacts memory would not be correct based on the outcomes from this study. However, if we bundled the emotions of fear and disgust together (as previous research appears to have done) and labeled the message as a "fear message" then we would make this conclusion.

Based on the current literature it appears that positive outcomes have been contributed to fear messages. In comparison, disgust has rarely been considered as an emotion that could be used in a health message. The implications are that public health practitioners and social marketers may be designing messages to evoke fear and not disgust. As shown in this study, a fearful message does not need to include a disgusting image. Fear can act independently from disgust. But fear was also shown to have a negative impact on message encoding. It would appear important that the emotion that is recommended to be used in a health message is actually the emotion that produces positive outcomes. Based on this last statement it is appropriate to have a closer look at how fear has been conceptualized in previous studies.

Studies that have included manipulation checks for different levels of fear conditions have tended to use multi—item scales to measure fear. The most frequently used scale (e.g., Beck & Lund, 1981; Mewborn & Rogers, 1979; Rogers & Mewborn, 1976) to measure fear consists of six items; fright, tension, nervousness, anxiety, discomfort, and nausea. The popularity of this scale still exists today with recent research on fear also relying on this scale as a manipulation check to differentiate high and low fear conditions (Cho & Salmon, 2006). Other researchers, such as Leventhal and Watts (1965) used five items consisting of fear, sadness, tension, anxiety, and nausea. Also of

interest is a fear measurement scale used is in a study conducted by Leventhal & Trembly (1967). The high fear condition in this study consisted of close ups of the mutilated bodies of car crash victims. This study found that only the emotional states of depression, disgust, aggression, and egotism differentiated the high fear from the low fear condition. What should be apparent from this previous statement is that an item related to "fear" was not included. One would assume that when measuring fear that at least one measurement item would consists of an emotional state that actually closely resembles fear. Instead, other emotional terms are measured and are interpreted as indicating that fear was evoked. Taken together, these measurement scales reveal that in order to measure fear researchers commonly use multiple terms, most notably, disgust and nausea.

Fear has also been categorized into different types of fear. Higbee (1969) described "nausea fear" as a nauseated, sick feeling brought on by viewing disgusting images. Leventhal and Trembly (1967) used 'inhibitory fear' which consists of inner tension and nausea. Rather than describing fear, these descriptions appear to be more akin to disgust. A 'nauseated, sick feeling' does not appear to closely resemble fear. One might argue that these descriptions resemble anxiety, though fear and anxiety are again different emotions (Lazerus, 1991). However, despite this assertion researchers still use the term nausea to measure fear. A logical question that arises from this statement is whether disgusting and nauseating things are in fact frightening. Research by Roseman, West, and Swartz (1994) would suggest otherwise.

Roseman and colleagues investigated the way that emotions could be differentiated. Their results indicated that fear was considered to be an emotion that made people want to run away or to be in a safe place. However, fear did not cause any feelings of nausea. Rather, it was disgust, not fear, that caused feelings of nausea. Based on the findings from the present study and this discussion it is questionable whether in

previous research the high fear conditions the dominant emotion evoked was actually fear.

In support of this statement previous research has reported that in high fear conditions feelings of disgust, not fear, were significantly higher (Leventhal & Trembly (1967). More recently Hammond et al., (2004) reported that disgust was experienced by more people who viewed graphic images on cigarette packets than fear. Despite the fact that disgust was reported to be the most commonly, and likely the most dominant, emotion evoked, follow up research on this study has continued to measure fear and not disgust (Kees et al., 2006).

This discussion questions whether research on fear messages that use graphic images are actually conducting research on fear. From the results of the present study it would appear possible that in previous research that use graphic images with fear messages, that disgust, rather than fear, could have been the dominant emotion evoked. This has direct implications to the way in which scientific results are interpreted, predictive models are built, and recommendations are made to practitioners. Disgust and fear are different emotions and produce different action tendencies (Lazerus, 1991). Furthermore, disgust is a complex, often contradictory emotion in that it can both attract and repel people. If we are to conduct research on the effect of emotions on persuasion one would assume that a prerequisite is that we know what emotion we are actually researching.

One could argue that it is not the images per se that cause fear, but the fact that the message is personalized. A message that is personalized (i.e., "this will happen to you") increases fear (Hale & Dillard, 1995) and researchers often used personalized messages in high fear conditions. Based on this argument, it is not the images per se that causes fear. Instead, it is the personalization of the message with the image being used as

a potentially negative outcome for not complying with the message's recommendations. The problem with this argument is that it has the effect of removing the emotion from the analysis. Instead we are left with the threat as the cause and not the emotion. To illustrate, feelings of guilt or shame could be used to threaten people, i.e., "if you do not comply with the message you will be a bad person". Subsequently, the emotion becomes almost irrelevant. From this perspective one could argue that high fear messages are in fact just high threat messages. Perhaps this is why some researchers have measured high fear messages using emotions such as sadness and depression. Research that uses these types of measures of fear more closely resembles research on negative emotions. As seen in the results from the present study, different negative emotions (disgust and fear) produce different outcomes. Therefore, research on emotions should focus on discrete emotions rather dichotomous labels (positive/negative) or combinations of emotions (which it appears previous research on fear has used).

In the present study, the high fear messages also made use of personalized language and this did appear to help to make the message more frightening. However, the absence of any interactions suggests that the inclusion of a disgusting image is not sufficient, nor is it necessary to evoke high fear. A potential criticism of this statement could be that in this study participants had limited exposure to the disgusting image. Previous research has involved much longer stimuli and repeated exposure. For example, in Janis & Feshbach's (1953) participants had to sit through a 15 minute presentation and in Leventhal and Trembly's (1967) study participants watch multiple images of bodies. However, it is unclear why multiple or prolonged feelings of disgust would be metamorphosed to fear. One could argue that it is the repeated reminder of the threat or consequences that makes this a high fear message. Again, this makes it the threat and not the emotion that is the driving force behind persuasion.

A potential criticism of the present study is that the images used were not strong enough to elicit strong feelings of disgust. Thus in order to be sufficient to magnify fear the image must be more graphic. The question becomes whether a more graphic image in this study might have been success in magnifying fear. In Pilot Study Three the image that evoked the most disgust was not chosen for inclusion in the main study. The rationale behind this decision was that this image evoked higher levels of fear than the other images (although disgust was still the dominant emotion evoked) and this may have confounded the results. Another concern of this study was to produce a realistic brochure, one that could potentially be viewed by a mass audience. One has to question the utility of conducting research on a persuasive message that will never, in reality, be created. Despite this concern highly graphic images are used in persuasive messages. The Right to Life, for example, use images of aborted fetuses to promote its cause (Figure 6.1). These are clearly disgusting and disturbing images. In the present study the high disgust image was the only image to produce positive outcomes. Because very graphic images are used by practitioners, and because it appears greater disgust produces greater outcomes, it may be appropriate for researcher to investigate highly disgusting images. In any event, the criticism of the strength of the images used in this study may not be valid when one considered that the autopsy image of exposed abdomen was quite graphic and when pre—tested evoked high levels of disgust.

Figure 6.1: Anti—abortion message from biblia.com

The above discussion has questioned whether a) fear is the dominant emotion experienced or measured in a high fear message that contains a graphic image and b) if it is the threat, not the emotion that drive persuasion. In this study, disgust did not magnify fear. Furthermore, there were no interactions reported for disgust and fear on any dependent variable. This is important because it suggests that individual emotions can produce different outcomes. If it is the threat, rather than emotion, that drives persuasion then we would not see differences based on emotion. The high fear message contained a threat. If the threat drives persuasion, then disgust should not have had a separate effect. Because disgust and fear did differ, regardless of the threat, it must be concluded that it is emotion that drives persuasion.

Furthermore, because different emotions produce different outcomes it becomes important to ensure that future researchers confirm which emotion is primarily evoked. If research contributes outcomes to the wrong emotion, then any conclusions based on these outcomes may be dubious. Moreover, predictive models or recommendations to practitioners may well be wrong. It is not sufficient to measure fear using terms such as depression, sadness, nausea, and discomfort. The use of these types of terms serves to obscure, rather than reveal, the primary emotion that is being evoked. Instead, if fear is to

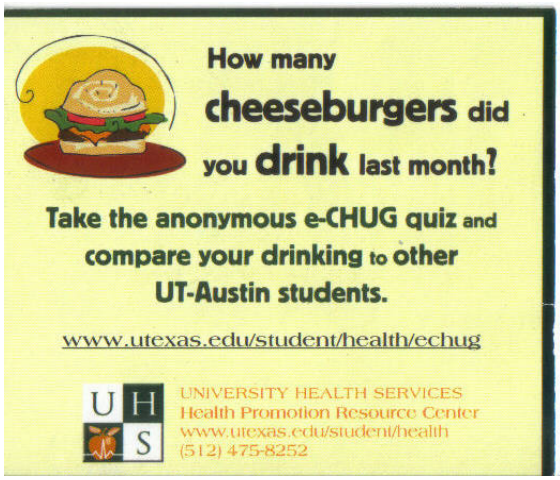
be measured then items that used terminology similar to fear should be used. The same would hold true for measuring disgust.

To this present day, many public health campaigns still use disgusting images in their advertisements. Under the current rubric these types of messages would be considered fear messages. In addition, these messages may, or may not, contain explicit threats. Two advertisements in Figure 6.2 illustrate the complexity here. The drunk driving message contains no threat or personalized messages. Similarly the hepatitis message does contain a personalized message but there is no direct threat. Instead, readers are encouraged to elaborate on the issue and to take action. It would seem important to know whether these types of messages are effective in changing behavior. Furthermore, understanding why these messages are, or are not, persuasive would have implications for the design of future health messages. It would appear to be relevant to know which emotion is evoked from these types of messages and to understand which components (i.e., inclusion of a threat, or a call to action) also contribute to the persuasion process.

Figure 6.2: Health messages that use graphic images

A further extension to the present study would be to examine messages, rather than images, that evoke disgust. The outcomes form such studies could further our understanding of the way that disgust affects persuasion and could have implications for the design of health messages. Disgust evoking text messages are currently used in practice and it would seem appropriate to determine whether, and in what way these messages are effective. For example, a university initiative (Figure 6.3) to decrease alcohol consumption among students converted the calories obtained from alcohol into the equivalent number of cheeseburgers. Students were asked, "How many cheeseburgers did you drink last month?" This type of message is more likely to evoke disgust because of the denaturalization of the cheeseburgers and subsequent visualization of consumption of these cheeseburgers. The thought of gulping down lumps of liquidized cheeseburger is not pleasant and would likely evoke disgust. Research on text messages such as this would increase our understanding of how disgust affects the persuasion process.

Figure 6.3: Drinking education flyer designed to evoke disgust



LIMITATIONS

There were several limitations in this study. First, the magnitude of emotion evoked in the participants was relatively low. Although participants' reported levels of experienced disgust and fear in the high disgust and high fear conditions were significantly higher than those reported in other conditions, the actual level of emotion evoked did not appear to be very high. A possible explanation for the low levels of emotion evoked could be due to the medium used in this study (one page brochure). The text and the single small image may not have been sufficiently powerful to evoke high levels of emotion. In contrast, a television commercial or PSA may have been more effective in evoking emotions. As mentioned previously, the image appeared to evoke more disgust in Pilot Study Three than in the main study. In the main study the image becomes a supplement to the text. In contrast, in the pilot study, the image is the focal point of attention. The inclusion of text may have served to decrease attention paid to the image and muted the impact of the image. It is not known whether the use of larger, or multiple images, would have been successful in evoking greater disgust. With a television commercial or PSA, the images are more likely to become the focal point of attention. This is because the viewer now does not need to devote attention to reading and processing the message. Instead, they can listen and watch the disgusting images. Furthermore, the use of a voice over would be able to convey an emotional tone- whether it is fear or disgust. In contrast, the text relies on a certain amount of interpretation.

Despite the fact that the level of emotion evoked was relatively low, disgust appears to have positive behavioral effects and fear appears to negatively impact memory encoding. This suggests to practitioners that high levels of emotions are not required to have an impact (either positively or negatively). This also raises the question of what effects higher levels of disgust and fear would have on the variables used in this study. A

suitable extension to the present study would be to replicate the design and use a medium that would be more effective in evoking higher levels of emotion.

A second limitation to the present study is the characteristics of the population who participated. The rationale for using university employees was based on the goal to have a population that more closely resembled the general population. It was anticipated that an older, full time employed population would be more sedentary than a younger student population. Moreover, the population used in this study would be the likely target of a campaign designed to increase physical activity. However, this population was very active and appears to be close to meeting the current recommendations for physical activity. It is possible that the use of a self—report measure of physical activity resulted in participants over—reporting their levels of physical activity. Other measures of physical activity were considered for this study. These included behavioral observation and telephone interviews to record physical activity. However, logistically these measures were considered to be too cumbersome for this study. The self—report was considered to be suitable because it is the current method used by the CDC and was reasonably easy to implement. An interesting finding from this study was that despite having a highly active population, evoking disgust was effective in motivating these highly active people to increase their vigorous activity. In effect, these individuals are already exercising frequently and the only way to increase their level of activity was by engaging in more vigorous activity. An extension of the current study would be to investigate the effect disgust has on individuals who engage in different levels of activity. This could include individuals who currently do not engage in any physical activity, or are currently contemplating engaging in physical activity.

Another characteristic of this population was that it included more women than men. Seventy-four percent of the participants were women. This was perhaps expected

because these participants were recruited from university offices. Women have previously been shown to be more sensitive to disgust than men (Haidt el al., 1994). Indeed, in this study women were found to be significantly more sensitive to disgust than men (t,(154)= -2.93, p=0.04). Besides gender, education level also effects disgust sensitivity. Doctoroff and McCauley (1996) have previously reported a negative correlation between education level and disgust sensitivity. Managers have also been reported to be less disgust sensitive than blue-collar workers (Haidt et al., 1994). The participants in this study were highly educated (the majority had a Bachelor's degree and a large percentage had a graduate degree) and worked in an office environment. Taking into account these additional factors, it becomes difficult to compare the disgust sensitivity of the participants used in this study to the general population. The issue of disgust sensitivity is important because it has implications for the design of messages and the images selected to evoke disgust. Caution is therefore needed when generalizing the results from this investigation.

A final limitation to this study is that the design initially assumed that participants were exposed to a single exposure to information regarding physical activity. However, the availability of brochures for participants to take with them may have produced a potential confound to this experiment. Specifically, participants may have read the brochures that they took which would have provided more information and motivation to engage in physical activity. It is therefore likely that participants received multi—exposures to the information rather than anticipated single exposure. It is also possible that it was the repeated or greater exposure to the information that resulted in greater vigorous activity being performed in the high disgust group (the high disgust group also took more brochures). Future research should therefore account for this effect and use designs that remove this potential confound.

GENERAL DISCUSSION

The growing number of physical inactive, overweight, and obese people is cause for concern because of the associated health issues and subsequent cost to treat these health issues. The benefits of regular physical activity are generally well known. Despite this assumption, less than half of the U.S. population engages in sufficient physical activity to derive health benefits (CDC, 2005b). It has been widely speculated and reported in the media that the current generation will be the first to outlive their children. These types of statements have increased awareness of the obesity issue. This study investigated whether disgust could be a persuasive emotion to use in a health message. Historically, disgust has been virtually ignored by the academic community. It has been suggested that a possible reason for this lack of empirical inquiry on disgust is because of the nature of the topic (S. Miller, 1993). It is almost as if by contagion, people who research disgust become, in some way, disgusting. For example, eminent disgust researcher Paul Rozin has been given the moniker of "Dr. Disgust." Yet, perhaps there are alternative explanations for the paucity of research on disgust. First, disgust is a complicated and contradictory emotion. Interventions using disgust need to be carefully designed in order that valid results are obtained. One need only revisit research by Nabi (1998) and Shimp and Stuart (2004) to witness the way in which the use of disgust in a message has produced unwanted effects. Complicating research on disgust is the fact that the meaning of disgust has evolved over time. Differentiating among different types of disgust added complexity to the present study. As yet, there does not appear to be a suitable way to reliably measure the difference between animal—nature, and moral disgust; at least within the context of physical activity. Even the theoretical and layperson's definition of disgust differ (Nabi, 2002). Thus, research on disgust is difficult, and for want for a better word, messy.

Second, previous literature appears to have confounded the emotion of disgust with fear. This has occurred in two ways. First, high and low fear conditions have been differentiated by including disgusting images in the high fear condition. Second, when measuring the affect produced by these conditions, researchers have relied on terminology that resembles disgust, not fear. Because of the way fear has been conceptualized (i.e., causing nauseous feelings) it appears that traditional research on fear has been examining a combination of emotions rather than discrete emotions. By bundling disgust with fear we have confounded research on disgust. In effect, disgust has been considered frightening.

This is a shame as the present study has shown that disgust appears to be a more effective emotion than fear to promote physical activity. People who viewed a highly disgusting image searched for more information and increased their vigorous activity. This is a major finding because vigorous activity provides the most benefit for health. More calories are expended performing vigorous activity and this will likely result in improved body composition (i.e., less fat). It would be expected that individuals who increase and then maintain their vigorous activity would become healthier, leaner, and at less risk to disease. This would be a desirable outcome from a public health campaign designed to decrease weight and improve health.

In addition to these benefits, the superiority of disgust over fear in terms of memory was observed. It would therefore appear questionable whether fear should be used in a health message. Based on the results from this study, it appears that disgust is a suitable emotion to use to promote physical activity, at least with the participants in this study. It is not known whether a less active population would also respond in the same way as the participants in this study.

The use of disgust in a health message could be controversial. Ethical concerns can be raised by using disgusting imagery in a message. People may not appreciate being exposed to such imagery, particularly if it used in mass media. To illustrate, a recent initiative by a Right to Life advocacy group involved a display of 20 foot posters of aborted fetuses next to a university gymnasium. These images, along with the subject matter, offended some people and caused a controversy at the university. Therefore the use of disgusting images may need to be considered thoroughly before deciding on their inclusion in a message.

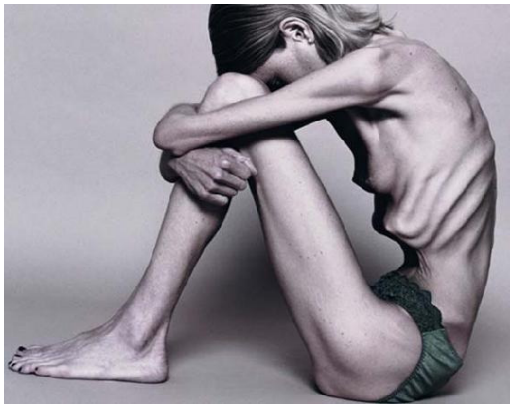
Furthermore, the use of disgust could potentially make physical activity and health a moral issue. The same process of moralizing smoking could well be applied to health and fitness. Guttman and Salmon (2004) argue that if people are made morally responsible for their health then social factors and the etiology of health problems may be ignored. Furthermore, labeling poor health as disgusting may cause other emotional reactions such as guilt and shame. These emotions may reinforce self—blame and helplessness in the very people who may be most at risk of obesity, overweight, or physical inactivity. Finally, the use of disgust could be used to stigmatize people who are obese, overweight, and physical inactive. Consequently negative stereotypes may be created and perpetuated. These could serve to devalue people and facilitate negative discrimination. These are all issues that the academic community, social marketer, and public health practitioners need to be aware of when dealing with the emotion of disgust.

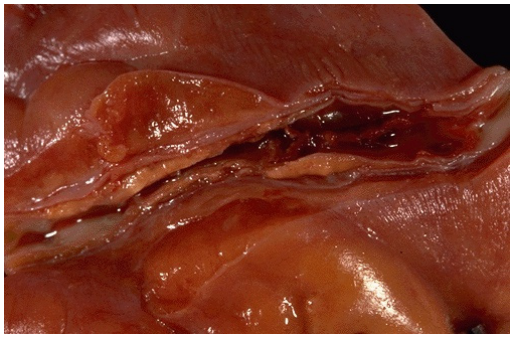
Despite this caveat, one must return to the current problem of obesity facing the U.S. and the rest of the world. It seems that frequently we are discovering more problems with obesity- whether it be parents whose children are now more likely to develop early diabetes or the early onset of puberty in obese children. It would seem prudent to find strategies to help combat the increase in overweight, obese, and

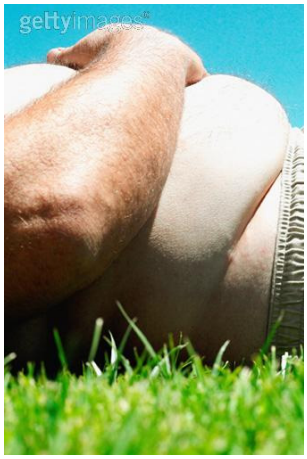
physically inactive people. The present study increased our understanding of the ways in which disgust and fear differ, the behavioral outcomes they produce, and in the way these emotions are cognitively processed. Moreover, this study provides evidence to suggest that disgust can be a persuasive emotion in promoting physical activity. Considering the current state and advancing trend of declining health and wellness in the U.S., it would therefore seem appropriate to advocate the use of disgusting images when promoting physical activity.

Appendix A

Pilot Study One Test Images



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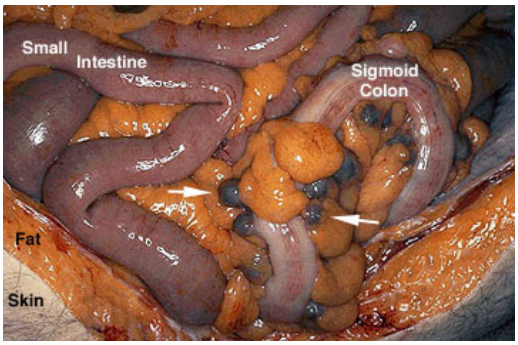
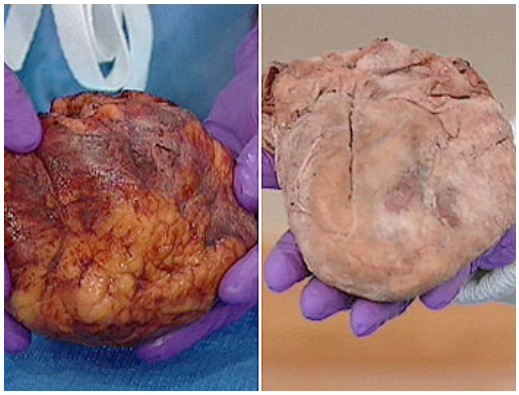

Small
Intestine
Sigmoid
Colon
Fat
Skin

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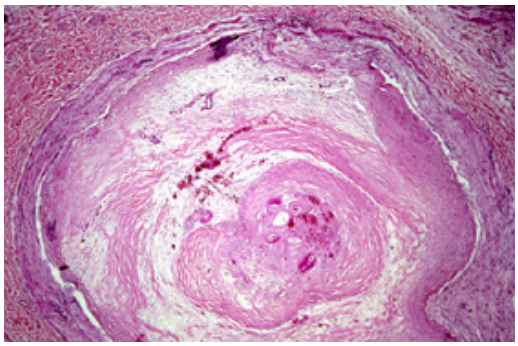


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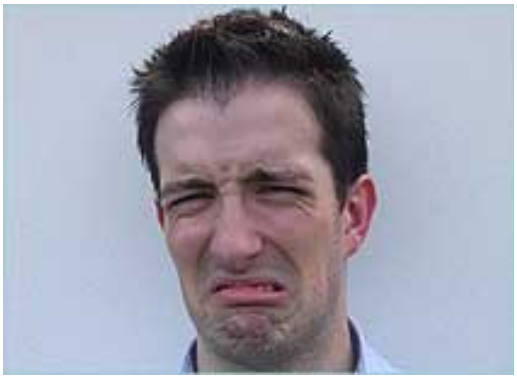


Appendix B

Pilot Study One Image Questionnaire

Image Study

Age:_____

Gender: Male / Female

Highest level of Education:
___ Some High School ___ High school graduate ___ Junior College
___ Currently enrolled at University ___ Bachelor's degree ___ Graduate degree

Ethnicity:
___ White ___ Hispanic/ Latino ___ African—American
___ Asian—American ___ Other _____

The next page will ask your opinion about different pictures. You will provide your opinion on a scale from "not at all" to "extremely." For example, if you were to think about eating a lemon, you might scale it this way:

Not at all bitter ___ ___ ___ ___ **X** ___ ___ extremely bitter

Now, please look at the pictures on the following pages.

Ref_____

To what extent does this picture make you feel….

Not at all disgusted	____	____	____	____	____	____	____	____	extremely disgusted
Not at all grossed out	____	____	____	____	____	____	____	____	extremely grossed out
Not at all revolted	____	____	____	____	____	____	____	____	extremely revolted
Not at all angry	____	____	____	____	____	____	____	____	extremely angry
Not at all furious	____	____	____	____	____	____	____	____	extremely furious
Not at all irate	____	____	____	____	____	____	____	____	extremely irate
Not at all fearful	____	____	____	____	____	____	____	____	extremely fearful
Not at all scared	____	____	____	____	____	____	____	____	extremely scared
Not at all frightened	____	____	____	____	____	____	____	____	extremely frightened
Not at all amused	____	____	____	____	____	____	____	____	extremely amused
Not at all guilty	____	____	____	____	____	____	____	____	extremely guilty

PLEASE TURN OVER

Ref_____

To what extent does the picture make you feel shame?

Not at all amount ____ ____ ____ ____ ____ ____ ____ ____ an extreme

To what extent does the picture make you feel contempt?

Not at all amount ____ ____ ____ ____ ____ ____ ____ ____ an extreme

To what extent does the picture make you feel disdain?

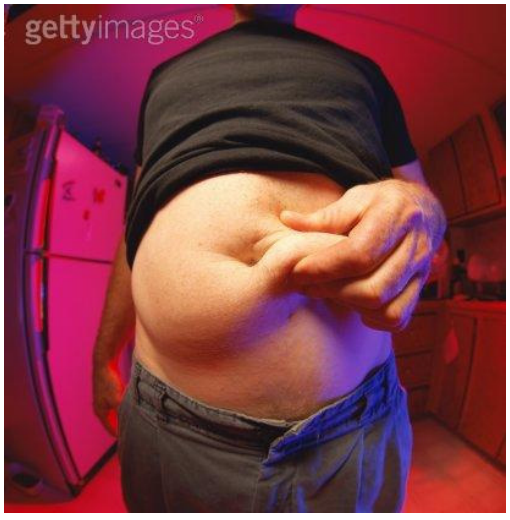
Not at all amount ____ ____ ____ ____ ____ ____ ____ ____ an extreme

PLEASE TURN TO THE NEXT PICTURE

Appendix C

Pilot Study Two Test Images


gettyimages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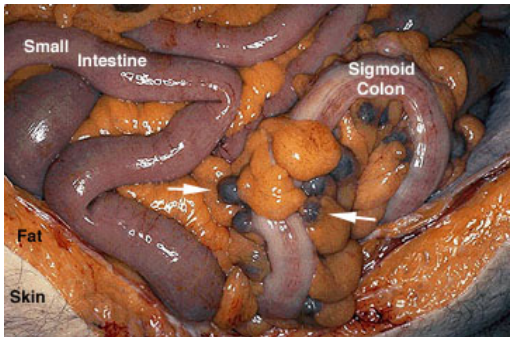
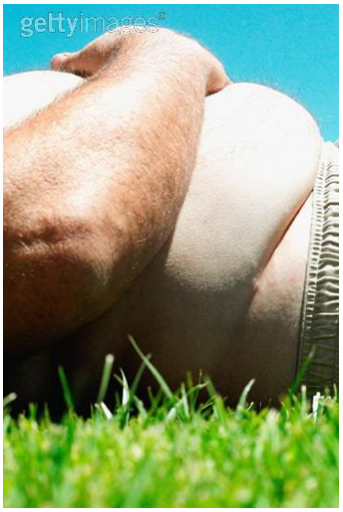
Appendix D

Pilot Study Three Test Images and Captions


Small
Intestine
Sigmoid
Colon
Fat
Skin


gettyimages


gettyimages

Appendix E

Pilot Study Three Questionnaire

Gender: Male / Female

After watching each slide we would like you to tell us how this slide made you feel. Please tell us how much you felt each of the feelings listed while you watched the slide.

Answer-
5 = If you felt the feeling **Very Strongly**
4= If you felt **Strongly**
3= If you felt **Somewhat Strongly**
2= If you felt **Not Very Strongly**
1= If you felt **Not at all**

Slide A

I felt….
Disgusted _____

Fearful _____

Grossed out _____

Scared _____

Revolted _____

Frightened _____

Answer the following questions

I believe the slide was written with me in mind
Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

I believe the slide related to me personally.
Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

The slide was meaningful to me.
Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

The slide did not have anything to do with me.
Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

The slide gave me a good idea.
Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

Please Turn To The Next Page

Appendix F

Recommendations for Designing Fear Messages

Witte, Meyer, and Martell (2001) state that there are two main components of a fear appeal.

a) The threat

The threat portion of the message outlines the negative consequences for not complying with the message's recommendations. The threat consists of:

- Susceptibility; the likelihood that a specific person will experience the threat
- Severity; the magnitude of harm expected from the threat.

b) The recommended response

The response one should do to avoid the threat. The recommended response consists of:

- Response efficacy; the extent to which the recommended response effectively averts the threat.
- Self efficacy; the extent to which the person perceives they are able to perform the recommended response to avert the threat

Appendix G

Informed Consent Form

INFORMED CONSENT TO PARTICIPATE IN RESEARCH

The University of Texas at Austin

You are being asked to participate in a research study. This form provides you with information about the study. The Principal Investigator (the person in charge of this research) or his representative will provide you with a copy of this form to keep for your reference, and will also describe this study to you and answer all of your questions. Please read the information below and ask questions about anything you don't understand before deciding whether or not to take part. Your participation is entirely voluntary and you can refuse to participate without penalty or loss of benefits to which you are otherwise entitled.

Title of Research Study:

The use of emotions in health communications

Principal Investigator(s) (include faculty sponsor), UT affiliation, and Telephone Number(s): Jules Woolf M.Ed. and Chris Green Ph.D. 512-750-1694/ 512- 471-1273

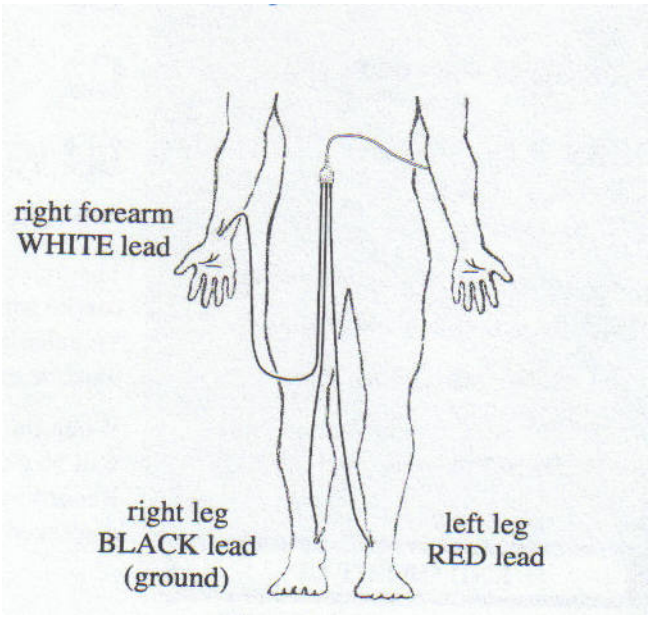
Funding source: Not applicable

What is the purpose of this study?

This study will investigate the use of emotions in health communications and how this affects cognitive processing. This study will require 120 participants.

What will be done if you take part in this research study?

If you agree to participate you will be required to complete a questionnaire and to read a brochure. In addition, you will be asked to have your heart rate recorded using an electrocardiogram. This will involve you having to have three surface electrodes attached to your body. These electrodes are attached using a mild adhesive and are very similar to a band-aid. Three electrodes will be attached to your body as shown in the diagram on the following page.



One electrode will be placed on the inside of your right wrist approximately 1.5 inches from your palm. The other two electrodes will be placed on the inside of your legs approximately 1.5 inches above your ankle. A male attendant (the principle investigator) will attach these electrodes. In the event that you would not want the principle investigator to attach these electrodes, you may request that you place them on yourself with the guidance of the principle investigator. You will be connected to the electrocardiogram while you read a brochure. You will experience very little, if any discomfort from these electrodes.

The Project Duration is:
This project will be completed today in one session lasting approximately 45 minutes

What are the possible discomforts and risks?
You will be asked to read a brochure while having your pulse rate recorded. The discomforts and risks are therefore minimal.

What are the possible benefits to you or to others?
You will receive a coupon for a free health and fitness evaluation by a trained fitness specialist. The results of this study can be used to design more effective health communications to combat the growing obesity problem in our society.

If you choose to take part in this study, will it cost you anything?
There are no financial costs associated with this study.

Will you receive compensation for your participation in this study?
You will receive a free coupon for health and fitness evaluation by a trained fitness specialist for participating in this study. The approximate value of this evaluation is $40. You will have two fitness tests to choose from. The first, called a Body Fit test, will provide you with information on your body composition, posture and flexibility. The second, called a Muscle Fit test, will provide you with information on your upper and lower body strength and power.

What if you are injured because of the study?
The University has no program or plan to provide treatment for research related injury or payment in the event of a medical problem. In the event of a research related injury, please contact the principal investigator.

If you do not want to take part in this study, what other options are available to you? Your participation in this study is entirely voluntary. You are free to refuse to be in the study, and your refusal will not influence current or future relationships with The University of Texas at Austin.

How can you withdraw from this research study and who should you call if you have questions?

If you wish to stop your participation in this research study for any reason, you should contact the principal investigator: Jules Woolf at (512) 750-1694. You should also call the principal investigator for any questions, concerns, or complaints about the research. You are free to withdraw your consent and stop participation in this research study at any time without penalty or loss of benefits for which you may be entitled. Throughout the study, the researchers will notify you of new information that may become available and that might affect your decision to remain in the study.

In addition, if you have questions about your rights as a research participant, or if you have complaints, concerns, or questions about the research, please contact Lisa Leiden, Ph.D., Chair, The University of Texas at Austin Institutional Review Board for the Protection of Human Subjects, or the Office of Research Compliance and Support at (512) 471-8871.

How will your privacy and the confidentiality of your research records be protected?
All questionnaire and results from this research study will be coded so that no personally identifying information is visible on them. All identifying marks will be destroyed at the conclusion of the study. The **records** of this study will be stored securely and kept confidential. Authorized persons from The University of Texas at Austin, members of the Institutional Review Board, and (study sponsors, if any) have the legal right to review your

research records and will protect the **confidentiality** of those records to the extent permitted by law. All publications will exclude any information that will make it possible to identify you as a subject. Throughout the study, the researchers will notify you of new information that may become available and that might affect your decision to remain in the study.

If in the unlikely event it becomes necessary for the Institutional Review Board to review your research records, then the University of Texas at Austin will protect the confidentiality of those records to the extent permitted by law. Your research records will not be released without your consent unless required by law or a court order. The data resulting from your participation may be made available to other researchers in the future for research purposes not detailed within this consent form. In these cases, the data will contain no identifying information that could associate you with it, or with your participation in any study.

Will the researchers benefit from your participation in this study*?*
This research is for partial fulfillment of requirements for degree of Doctor of Philosophy. There are no other benefits for the researchers from your participation.

Signatures:

As a representative of this study, I have explained the purpose, the procedures, the benefits, and the risks that are involved in this research study:

_____

Signature and printed name of person obtaining consent **Date**

You have been informed about this study's purpose, procedures, possible benefits and risks, and you have received a copy of this form. You have been given the opportunity to ask questions before you sign, and you have been told that you can ask other questions at any time. You voluntarily agree to participate in this study. By signing this form, you are not waiving any of your legal rights.

_____

Printed Name of Subject **Date**

PLEASE TURN OVER

_____

Signature of Subject **Date**

_____

Signature of Principal Investigator **Date**

Appendix H

Brochures used in Experiment (not actual size)

Clogged Artery Image- No Fear

Live Active!

Living an active lifestyle is important for your health and fitness. Regular physical exercise can:

- Help you lose fat, maintain a healthy body weight and make you feel more energetic
- Help build and maintain healthy bones, muscles, and joints
- Help you relax, sleep better and promote psychological well-being and your self-esteem
- Improve your posture and balance
- Help prevent heart disease, and other undesirable health issues

Who can benefit from leading an active lifestyle?

Everyone! The good news is that it is never too late to start and everyone can benefit, regardless of your age or current fitness level. Even if you think you are healthy it is still important to be active. If you are already active you can increase your activity levels for even greater benefits.

Where to Start- Be Active Everyday

Being physically active isn't as hard as you think. You can increase your daily activity by making small changes throughout your day.

- Walk whenever you can
- Take the stairs instead of the elevator
- Walk up escalators
- Park further away from your destination and walk the rest of the way
- Play actively with your kids
- Walk or play with pets
- Challenge family, friends and work colleagues to be active with you

Simple activities like these can increase the number of calories you burn everyday!

Moderate intensity exercise is important too!

You should try to put together at least 30 minutes of moderate intensity physical activity each day. All 30 minutes does not have to be done at once, you can accumulate the 30 minutes throughout the day.

Regular physical activity can help prevent fat build up

Moderate exercise can be:

- Brisk walking that causes a slight increase in your breathing
- Dancing
- Working in the garden
- Cycling

Completing 30 minutes of moderate intensity exercise has been shown to improve health indicators such as blood pressure and blood cholesterol.

Do Strenuous Exercise for best results

Strenuous exercise can provide even more health and fitness benefits. "Strenuous" implies activities that will make your heart beat rapidly and makes you "huff and puff". For best results, strenuous exercise should be carried out for a minimum of 30 minutes, three to four times a week.

Strenuous exercise includes:

- Doing an aerobics or fitness class
- Jogging or running
- Playing sports such as basketball, soccer, and squash
- Mountain Biking

Although there's no age barrier to carrying out strenuous exercise, if you have been inactive then you should speak with your doctor first.

How do you know how fit you are?

People are all sorts of different shapes and sizes so it is hard to know how healthy and fit you are. Having a fitness test lets you know where your fitness level is right now and can be a great way to motivate you to be more physically active.

The Fitness Institute of Texas offers a number of health and fitness tests for people of all fitness levels.

You can use the coupon from this brochure to get a free fitness test.

Remember– increasing your physical activity levels can be achieved in a number of different ways. Make a commitment and start today.

Book your fitness test today and Live Active!

Exposed Abdomen Image- No Fear

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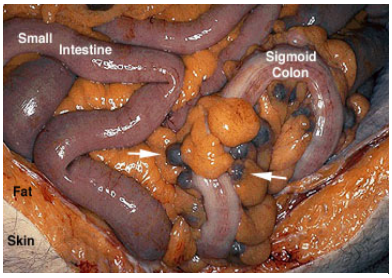

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Neutral Image- No Fear

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Clogged Artery Image- High Fear

Live Active!

Living an active lifestyle is important for your health and fitness. Being physically inactive can make you:

- Gain unsightly body fat
- Get clogged arteries which raises blood pressure.
- Develop psychological problems such as depression and insomnia
- Increase your risk of getting a number of cancers and diseases, such as colon cancer, & gall bladder disease
- Increase your risk of heart disease and early death!

Who is at risk from getting heart disease?
Everyone! Children as young as 5 years old develop symptoms of coronary heart disease, such as clogged arteries. Your arteries are constantly building up plaque deposits and to reduce your risk of heart disease you need to stay active. If you are already active you can increase your activity levels for even greater benefits.

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Inactive people are twice as likely to get heart disease as active people!

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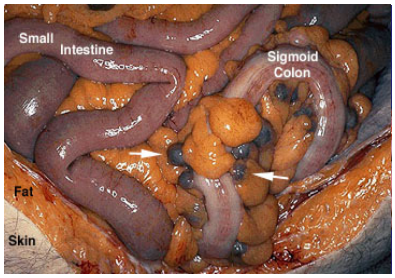

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Appendix I

Main Study Questionnaires

Pre—appointment Questionnaire

Please answer the following 2 questions and bring this sheet when you come to participate in the research study. Thank you.

1. On a seven point scale, with 1 being extremely unimportant and 7 being extremely important, how important do you think it is to be physically active?"

Extremely unimportant *1* *2* *3* *4* *5* *6* *7* *Extremely Important*

2. We are interested in two types of physical activity - vigorous and moderate. Vigorous activities cause large increases in breathing or heart rate while moderate activities cause small increases in breathing or heart rate.

Now, thinking about the moderate activities you do in a usual week, how often do you do moderate activities for at least 10 minutes at a time, such as brisk walking, bicycling, vacuuming, gardening, or anything else that causes some increase in breathing or heart rate?

_____ Number of time per week

And on average how long does each of these activities last?
_____ minutes

Now, thinking about the vigorous activities you do in a usual week, how often do you do vigorous activities for at least 10 minutes at a time, such as running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate?
_____ Number of time per week

And on average how long does each of these activities last?
_____ minutes

Section A

We are now interested in what you were thinking about when you read this brochure. You might have had ideas all favorable to the recommendations in the brochure, all opposed, all irrelevant to the recommendations of the brochure, or a mixture of the three. Any case is fine; simply list what it was that you were thinking while you read the brochure (space is provided on the next page). Try to list each thought or idea on a separate line. Please state your thoughts and ideas as concisely as possible…a phrase is sufficient. IGNORE SPELLING, GRAMMAR, AND PUNCTUATION. You will have 3 minutes to write your thoughts. We have deliberately provided more space than we think most people will need to insure that everyone would have plenty of room to write the ideas they had during the message. So don't worry if you do not fill the page. Just write down whatever your thoughts were during the message. Please be completely honest and list all of the thoughts that you had. Now turn the page and use the space provided to list your thoughts.

Section B

In this next section we are interested in your thoughts and feelings. Please read each of the statements below and indicate how much you agree with the statement by circling one of the numbers shown.

For example.

If the statement reads:

"The brochure made me feel nervous"

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

And you strongly disagree with this statement, then you would circle the number 1 on the scale.

e.g.

"The brochure made me feel nervous"

Strongly Disagree [1] 2 3 4 5 6 7 Strongly Agree

Alternatively, if you agreed with this statement somewhat, you might circle a higher number, such as the number 6.

e.g.

"The brochure made me feel nervous"

Strongly Disagree 1 2 3 4 5 [6] 7 Strongly Agree

If you have any questions please ask.

Now turn the page and read the statements listed

1. The brochure made me feel **disgusted**,

not at all 1 2 3 4 5 6 7 very strongly

2. The brochure made me think about my own experiences with physical activity

Strongly disagree 1 2 3 4 5 6 7 Strongly agree.

3. The brochure made me feel **fearful**,

not at all 1 2 3 4 5 6 7 very strongly

4. The brochure made me think about what it would be like to be more physically active

Strongly disagree 1 2 3 4 5 6 7 Strongly agree.

5. The brochure made me feel **grossed out,**

not at all 1 2 3 4 5 6 7 very strongly

6. I believe the brochure related to me personally

Strongly disagree 1 2 3 4 5 6 7 Strongly agree.

7. The brochure made me feel **scared,**

not at all 1 2 3 4 5 6 7 very strongly

8. The brochure made me feel **revolted,**

not at all 1 2 3 4 5 6 7 very strongly

9. The brochure reminded me of my own experiences with physical activity

Strongly disagree 1 2 3 4 5 6 7 Strongly agree.

10. I believe the brochure was written with me in mind

Strongly disagree 1 2 3 4 5 6 7 Strongly agree.

11. The brochure made me feel **frightened,**

not at all 1 2 3 4 5 6 7 very strongly

For Questions 12-27 indicate whether you agree or disagree with the statement listed.

12. I might be willing to try eating monkey meat, under some circumstances.

Agree / Disagree

13. It bothers me to see someone in a restaurant eating messy food with his fingers.

Agree / Disagree

14. It would bother me to see a rat run across my path in a park.

Agree / Disagree

15. Seeing a cockroach in someone else's home doesn't bother me.

Agree / Disagree

16. It bothers me to hear someone clear a throat full of mucous.

Agree / Disagree

17. If I see someone vomit, it make me sick to my stomach.

Agree / Disagree

18. I think homosexual activities are immoral.

Agree / Disagree

19. I think it is immoral for people to seek sexual pleasure from animals.

Agree / Disagree

20. It would bother me to be in a science class, and to see a human hand preserved in a jar.

Agree / Disagree

21. It would not upset me at all to watch a person with a glass eye take their eye out of the socket.

Agree / Disagree

22. It would bother me tremendously to touch a dead body.

Agree / Disagree

23. I would go out of my way to avoid walking through a graveyard.

Agree / Disagree

24. I never let any part of my body touch the toilet seat in public restrooms.

Agree / Disagree

25. I probably would not go to my favorite restaurant if I found out that the cook had a cold.

Agree / Disagree

26. Even if I was hungry, I would not drink a bowl of my favorite soup if it had been stirred by a used but thoroughly washed flyswatter.

Agree / Disagree

27. It would bother me to sleep in a nice hotel room if I knew that a man had died of a heart attack in that room the night before.

Agree / Disagree

For Questions 28-43 read each statement and then consider how this makes you feel. Indicate by circling whether the statement makes you feel very disgusted, slightly disgusted, or not at all disgusted.

28. You see someone put ketchup on vanilla ice cream, and eat it.

Very disgusted Slightly disgusted Not at all disgusted

29. You are about to drink a glass of milk when you smell that it is spoiled.

Very disgusted Slightly disgusted Not at all disgusted

30. You see maggots on a piece of meat in an outdoor garbage pail.

Very disgusted Slightly disgusted Not at all disgusted

31. You are walking barefoot on concrete, and you step on an earthworm.

Very disgusted Slightly disgusted Not at all disgusted

32. You see a bowel movement left unflushed in a public toilet.

Very disgusted Slightly disgusted Not at all disgusted

33. While you are walking through a tunnel under a railroad track, you smell urine.

Very disgusted Slightly disgusted Not at all disgusted

34. You hear about an adult woman who has sex with her father.

Very disgusted Slightly disgusted Not at all disgusted

35. You hear about a 30-year-old man who seeks sexual relationships with a 80-year-old woman.

Very disgusted Slightly disgusted Not at all disgusted

36. You see someone accidentally stick a fishing hook through his finger.

Very disgusted Slightly disgusted Not at all disgusted

37. You see a man with his intestines exposed after an accident.

Very disgusted Slightly disgusted Not at all disgusted

38. Your friend's pet cat dies, and you have to pick up the dead body with your bare hands.

Very disgusted Slightly disgusted Not at all disgusted

39. You accidentally touch the ashes of a person who has been cremated.

Very disgusted Slightly disgusted Not at all disgusted

40. You take a sip of soda, and then you realize that you drank from the glass that an acquaintance of yours had been drinking from.

Very disgusted Slightly disgusted Not at all disgusted

41. You discover that a friend of yours changes underwear only once a week.

Very disgusted Slightly disgusted Not at all disgusted

42. A friend offers you a piece of chocolate shaped like dog-doo.

Very disgusted Slightly disgusted Not at all disgusted

43. As part of a sex education class, you are required to inflate a new unlubricated condom, using your mouth.

Very disgusted Slightly disgusted Not at all disgusted

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44. How important do you think it is to be physically active?

Extremely unimportant *1* *2* *3* *4* *5* *6* *7* *Extremely Important*

Please turn the page and answer the questions in the next section

Section C

We are interested in two types of physical activity- vigorous and moderate. Vigorous activities cause large increases in breathing or heart rate while moderate activities cause small increases in breathing or heart rate.

Now, thinking about the moderate activities, in the next 7 days how often do you intend to do moderate activities for at least 10 minutes at a time, such as brisk walking, bicycling, vacuuming, gardening, or anything else that causes some increase in breathing or heart rate.

_____ Number of time per week

And on average how long do you think each of these activities will last?
_____ minutes

Now, thinking about the vigorous activities, in the next 7 days, how often do you intend to do vigorous activities for at least 10 minutes at a time, such as running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate.
_____ Number of time per week

And on average how long do you think each of these activities will last?
_____ minutes

Now please complete the following information

Age: _____

Sex: Male / Female (please circle one)

Ethnicity: (circle one)

White Hispanic African-American Asian-American

Other _____

What is the highest level of education you have achieved:

Some High School ___ High School graduate ___ Junior College ___

currently enrolled at university ___ Bachelor's degree ___ Graduate degree ___.
___

Section D

Think back to the brochure you just read. Write down as many facts that you can remember from this brochure. Facts may include recommendations provided by the brochure, as well as benefits of physical activity and risks of physical inactivity. Try and be specific as possible. You will have 5 minutes to complete this task. Use the space below.

Section D

Look at the 10 statements below. Some of these statements appeared in the brochure you read earlier and some of them did not. Circle each statement that you recall being in the brochure that you read.

1. Strenuous exercise includes mountain biking.
2. Regular physical activity can improve your posture and balance.
3. Regular physical activity can prolong your life.
4. Being physically active isn't as hard as you think.
5. Being physically inactive can make you develop psychological problems such as depression and insomnia.
6. You should wear comfortable and loose fitting clothing when exercising.
7. If you are already active you can increase your activity levels for even greater benefits.
8. The good news is that it is never too late to start.
9. Physical activity can be fun and a great way to meet people.
10. Your arteries are constantly building up plaque deposits.

Observation Data

Time Spent Reading: _____

Information seeking:

Brochure	Number taken
1. FIT 1- Lower Body Strength	_____
2. FIT 2: Core Strength & Muscular Endurance	_____
3. FIT 3- Stretching	_____
4. Training- Rec sports	_____
5. Health Promotion Resource Center	_____
6. Body Image Attitudes & Actions	_____
7. Men- Eating for power	_____
8. Eating Well with no time & no money	_____
9. Caffeine	_____
Total Brochures Taken	

Initiation of exercise behavior

Today's date: _____

Coupon Expiration date: _____

Coupon Redeemed: YES / NO

Post Appointment Questionnaire

Please answer the following questions and send it back to juleswoolf@mail.utexas.edu. Thank you.

1. Think back to the brochure you read.
   How many people did you talk to about the brochure you read?
   Did you tell them about the information contained in the brochure?
   Did you tell them about the pictures in the brochure?

2. Did you tell anyone about the fitness test you were offered for participating in the study?
   If so, approximately how many people did you tell?
3. Did you tell anyone about the Fitness Institute of Texas?
   If so, approximately how many people did you tell?

4. Did you phone/email the Fitness Institute of Texas to arrange an appointment for your free fitness test?

5. Did you use your free fitness test coupon?
   If no, please tell me your reasons for not using it?

6. In the research study we asked you about two types of physical activity - vigorous and moderate. Vigorous activities cause large increases in breathing or heart rate while moderate activities cause small increases in breathing or heart rate.

.

Now, thinking about **the last 7 days** how often did you do moderate activities for at least 10 minutes at a time, such as brisk walking, bicycling, vacuuming, gardening, or anything else that causes some increase in breathing or heart rate.

_____ Number of time per week

On average how long do these activities last?
_____ minutes

Again, thinking about **the last 7 days**, how often did you do vigorous activities for at least 10 minutes at a time, such as running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate.

_____ Number of time per week

And on average, how long do these activities last?
_____ minutes

Appendix J

Message Encoding Answer Key

Correct responses are indicated in bold and underlined.

NO FEAR MESSAGE

1. **Strenuous exercise includes mountain biking.**
2. **Regular physical activity can improve your posture and balance.**
3. Regular physical activity can prolong your life.
4. **Being physically active isn't as hard as you think.**
5. Being physically inactive can make you develop psychological problems such as depression and insomnia.
6. You should wear comfortable and loose fitting clothing when exercising.
7. **If you are already active you can increase your activity levels for even greater benefits.**
8. **The good news is that it is never too late to start.**
9. Physical activity can be fun and a great way to meet people.
10. Your arteries are constantly building up plaque deposits.

FEAR MESSAGE

1. **Strenuous exercise includes mountain biking.**
2. Regular physical activity can improve your posture and balance.
3. Regular physical activity can prolong your life.
4. **Being physically active isn't as hard as you think.**
5. **Being physically inactive can make you develop psychological problems such as depression and insomnia.**
6. You should wear comfortable and loose fitting clothing when exercising.
7. If you are already active you can increase your activity levels for even greater benefits.
8. **The good news is that it is never too late to start.**
9. Physical activity can be fun and a great way to meet people.
10. **Your arteries are constantly building up plaque deposits.**

Appendix K

Email Invitation

Subject Line: Participants required for a short University Research study.

Participants are currently being recruited to participate in a University study in Belmont Hall, located at the Darrell K Royal-Texas Memorial Stadium. This study will require approximately 30 minutes of your time. The research study is on health and emotions. You will be required to read a brochure and complete a questionnaire.

For participating you will receive a free gift valued at $40.

If you are interested in participating in this study and would like to book an appointment please contact Jules Woolf and BC Green at 512 -750-1694 or email juleswoolf@mail.utexas.edu.

Appointments are available morning, noon, and night and on the weekends!

Space is limited and availability will be on a first come first served basis. So email today to reserve your spot!

Appendix L

Follow up (16 days after experiment) email

Dear,

Thank you very much for participating in my study. Your participation is extremely helpful and will enable me to complete my dissertation.

Could you please complete one final short questionnaire (6 questions). I have attached the questionnaire and it should not take you more than a few minutes to complete. When you are finished you can email it to me.

When you complete this questionnaire you will also be entered into a drawing to win a $30 gift certificate to the Alamo Drafthouse Cinema. The drawing will take place when the study is finished (early September). The winner will be notified directly and a notice placed outside my office.

Finally, please DO NOT tell anyone else you know (friends, colleagues, etc.) who participated about this final questionnaire until after the study is complete in September. I will contact them in due course.

Again, thank you for participating in my study. Let me know if you have any questions.

Best,

Jules Woolf
Doctoral Candidate
Department of Kinesiology and Health Education

Appendix M

Further details on results from data analysis

Table M.1: Mean scores and standard deviations for disgust and fear by treatment group.

Treatment Manipulation	Experienced Disgust	Experienced Fear
Neutral Image x No Fear Message	1.15 (0.60)	1.53 (1.04)
Neutral Image x Fear Message	1.40 (0.93)	2.22 (1.43)
Artery Image x No Fear Message	1.50 (0.67)	1.65 (0.78)
Artery Image x Fear Message	2.17 (1.59)	2.44 (1.73)
Guts Image x No Fear Message	2.78 (1.50)	1.96 (1.05)
Guts Image x Fear Message	2.73 (1.89)	2.32 (1.30)

Table M.2: Mean scores and standard errors for memory variables and physical activity variables by treatment group.

Source	Treatment Group*					
	NI x NF	NI x F	A x NF	A x F	G x NF	G x F
	Memory Variables					
Memory Retrieved- correct	8.46	9.13	9.27	8.72	9.62	8.40
	(0.73)	(0.70)	(0.70)	(0.70)	(0.70)	(0.69)
Memory Retrieved- incorrect	1.04	1.16	0.92	1.18	1.08	1.44
	(0.25)	(0.24)	(0.24)	(0.24)	(0.24)	(0.24)
Encoding- correct	3.79	2.95	4.01	3.25	3.79	3.04
	(0.20)	(0.19)	(0.19)	(0.19)	(0.19)	(0.18)
Encoding- incorrect	0.66	1.51	0.66	1.89	0.57	2.00
	(0.17)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)
	Processing Variables					
Time reading	111.44	120.25	122.34	115.67	126.34	122.77
	(5.83)	(5.57)	(5.59)	(5.65)	(5.62)	(5.50)
Total thoughts	3.91	5.27	5.51	4.54	4.89	5.45
	(0.43)	(0.41)	(0.41)	(0.42)	(0.41)	(0.40)

* NI= neutral image, A= artery image, G= guts image, NF= no fear message, F= fear message

Table M.3: Means and standard errors for moderate and vigorous physical activity by treatment group

Treatment Manipulation	Time Point		
	Pre—intervention	Post—intervention	16d Post intervention
	Minutes of Moderate Physical Activity per Week		
NI x NF	169.98 (49.39)	182.04 (47.42)	177.72 (53.10)
NI x F	186.59 (45.85)	151.65 (49.29)	166.66 (49.29)
A x NF	256.61 (44.47)	251.70 (42.69)	189.50 (47.81
A x F	107.62 (46.84)	106.85 (44.97)	112.23 (50.36)
G x NF	176.90 (46.94)	177.15 (45.06)	149.95 (50.46)
G x F	155.17 (47.57)	172.28 (45.67)	230.31 (51.14)
	Minutes of Vigorous Physical Activity per Week		
NI x NF	96.15 (26.15)	107.25 (24.85)	83.88 (42.70)
NI x F	106.56 (24.27)	119.90 (23.06)	99.83 (39.64)
A x NF	126.89 (23.54)	128.16 (22.37)	88.09 (38.44)
A x F	91.78 (24.79)	104.57 (23.56)	120.33 (40.50)
G x NF	102.56 (24.85)	132.41 (23.61)	175.52 (40.58)
G x F	76.48 (25.18)	106.62 (23.93)	102.28 (41.13)

Table M.4a: Mean and standard error for types of thoughts generated by disgust and fear

Source	Neutral Image	Artery image	Guts image	No Fear message	Fear Message
Positive relevant thoughts	1.45 (0.23)	1.87 (0.23)	1.71 (0.23)	1.72 (0.19)	1.63 (0.18)
Negative relevant thoughts	0.39 (0.10)	0.20 (0.10)	0.31 (0.10)	0.26 (0.08)	0.35 (0.08)
Neutral relevant thoughts	2.73 (0.27)	2.93 (0.27)	3.17 (0.27)	2.81 (0.22)	3.07 (0.22)
Irrelevant thoughts	0.92 (0.15)	0.38 (0.15)	0.56 (0.15)	0.60 (0.12)	0.65 (0.12)

Table M.4b: Mean and standard error for types of thoughts generated by treatment group

Source	Treatment Group*					
	NI x NF	NI x F	A x NF	A x F	G x NF	G x F
Positive relevant thoughts	1.58	1.33	1.91	1.82	1.68	1.74
	(0.33)	(0.32)	(0.32)	(0.32)	(0.32)	(0.32)
Negative relevant thoughts	0.21	0.58	0.27	0.13	0.30	0.33
	(0.15)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)
Neutral relevant thoughts	2.18	3.28	3.32	2.55	2.94	3.40
	(0.39)	(0.38)	(0.38)	(0.38)	(0.39)	(0.38)
Irrelevant thoughts	0.78	1.06	0.26	0.51	0.76	0.37
	(0.22)	(0.21)	(0.21)	(0.21)	(0.21)	(0.21)

* NI= neutral image, A= artery image, G= guts image, NF= no fear message, F= fear message

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